Natural Sciences and Engineering
Research Council of Canada

200 Kent Street
Ottawa, Canada
K1A 1H5

Conseil de recherches en sciences
naturelles et en génie du Canada

200, rue Kent
Ottawa, Canada
K1A 1H5

STRATEGIC GRANTS IN OPEN

LES SUBVENTIONS THÉMATIQUES DANS LE DOMAINE OUVERT

- Summaries of New Research Projects
  Résumés de nouveaux projets de recherche
- List of Ongoing Research Projects
  Liste de projets de recherche en cours
- Summaries of Completed Projects
  Résumés de travaux de recherche terminés

1986-87

Canada

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FORWARD / AVANT-PROPOS

FOREWORD

The Natural Sciences and Engineering Research Council offers a program of strategic grants to initiate or accelerate research projects in areas of Canadian interest. The aim of the program is to enable university researchers to make greater contributions than in the past towards the understanding or solution of problems of national concern, either through specific applied research projects having potential for relatively short-term benefits, or through more basic research activities designed to develop knowledge in areas of potential importance. The total budget for the strategic grants program for 1986-87 is $32 million.

In 1986-87 the strategic grants program addressed eight specific fields: 1) biotechnology, 2) communications and computers, 3) energy, 4) environmental toxicology, 5) food and agriculture, 6) industrial materials and processes, 7) oceans, and 8) open (which includes areas of national concern other than the seven identified fields).

Selection panels composed of recognized scientists and engineers from the university, industry and government sectors rate all proposals using the following criteria:

- scientific merit of the proposed research;
- excellence of the applicant(s);
- relevance of the proposed research to the field.

AVANT-PROPOS

Le Conseil de recherches en sciences naturelles et en génie offre un programme de subventions thématiques visant à lancer ou à accélérer des projets de recherche dans des domaines d'intérêt national. Le but de ces subventions est de permettre aux chercheurs universitaires de contribuer davantage à la compréhension et à la solution de problèmes d'intérêt national. Il peut s'agir de recherche appliquée pouvant s'avérer utile à court terme ou encore de recherche plus fondamentale destinée à augmenter la somme des connaissances dans des domaines d'intérêt national. Le budget total du programme en 1986-1987 est de 32 millions de dollars.

En 1986-1987, le programme de subventions thématiques comprenait huit domaines choisis: 1) l'alimentation et l'agriculture, 2) la biotechnologie, 3) l'énergie, 4) les matériaux et procédés industriels, 5) les océans, 6) le thème "ouvert" (regroupant des domaines d'intérêt national autres que les sept domaines choisis), 7) les télécommunications et l'informatique et enfin, 8) la toxicologie de l'environnement.

Des comités de sélection composés de scientifiques et d'ingénieurs reconnus provenant des secteurs universitaire, industriel et gouvernemental utilisent les critères suivants pour évaluer toutes les demandes:

- valeur scientifique de la recherche proposée;
- excellence des candidats;
- pertinence du projet par rapport au domaine désigné.

Each criterion carries equal weight. To be funded, an application must receive a high ranking under each of the three criteria. Regional considerations do not enter into the evaluation of proposals submitted under this program. The panels are responsible for deciding what is relevant to, and of priority within, the broad areas identified for support, consistent with the descriptions of the fields.

Les comités doivent accorder une importance égale à chacun des critères. Pour obtenir une subvention, le projet doit recevoir une cote élevée en fonction de chacun des trois critères. Les considérations régionales ne doivent pas entrer en ligne de compte dans l'examen des demandes. Les comités ont la responsabilité de déterminer la pertinence des divers secteurs et leur priorité à l'intérieur de chaque domaine désigné, en se basant sur les descriptions des domaines.

The strategic grants program contributes to the training of research manpower and encourages the transfer of technology to the user sector. This is the basis of its success. To facilitate this technology transfer, NSERC annually publishes booklets describing some of the research funded through the program. There is a separate booklet for each field; each one contains summaries of the new research projects funded as a result of the annual strategic grants competition, a list of all on-going projects funded by NSERC in the particular field, and summaries of strategic research projects completed in 1986, including references to publications arising from the NSERC-funded research. Further information on the research being supported by NSERC may be obtained by contacting the researcher directly, or the Strategic Grants Division at (613) 996-1597.

Le programme de subventions thématiques contribue à former des chercheurs et donne lieu à un transfert de technologie au secteur des utilisateurs: voilà la base de son succès. Afin de faciliter le transfert de technologie, le CRSNG publie, chaque année, des livrets décrivant la recherche subventionnée dans le cadre de ce programme. Chaque domaine fait l'objet d'un livret séparé; on y retrouve un résumé des nouveaux projets de recherche subventionnés suite au concours annuel de subventions thématiques, une liste de tous les projets en cours dans le domaine en question subventionnés par le CRSNG et un résumé des projets de recherche thématique terminés en 1986, y compris des références aux publications découlant de la recherche subventionnée par le CRSNG. Des renseignements supplémentaires sur les projets de recherche appuyés par le Conseil peuvent être obtenus en communiquant avec le chercheur lui-même ou avec la division des subventions thématiques au (613) 996-1597.

NSERC offers other opportunities for technology transfer under its university/industry program. Further information on this program or on any of NSERC's awards programs may be obtained by calling (613) 995-5992 or by writing:

Le CRSNG offre d'autres possibilités pour le transfert technologique grâce à son programme conjoint universités-industrie. Pour plus d'information sur ce programme ou sur les autres programmes du CRSNG, veuillez téléphoner au (613) 995-5992 ou vous adresser au:

NSERC
Communications Division
200 Kent Street
Ottawa, Ontario
K1A 1H5

CRSNG
Division des communications
200, rue Kent
Ottawa (Ontario)
K1A 1H5

FIELD DESCRIPTION / DESCRIPTION DU DOMAINE

THE OPEN AREA

The Open Area is a category in the Strategic Grants Program in which awards are made to support research projects in areas of national concern other than those already identified for support (i.e. biotechnology, communications and computers, energy, environmental toxicology, food/agriculture, industrial materials and processes and oceans).

Two types of research are eligible for support in the Open category. The first is research aimed primarily at the utilization, application and further development of existing knowledge and expertise, including technology transfer. The second is general development and creation of knowledge and expertise in specific areas of national concern (other than the seven areas chosen by NSERC).

Proposals should fall into one of the following two broad categories in order to justify funding:

1. science and engineering for industrial and socio-economic benefit;

2. science for public policy, i.e. the application of concepts and knowledge to issues of public policy.

The Open Area is an invitation to the research community to participate actively in the definition of new areas of research that are in the national interest by submitting innovative and challenging proposals.

Examples of subject areas for which strategic grants have been awarded in the Open Area include:

Biomedical engineering
Forestry
Geo-sciences
Instrument development
Lasers
Low-temperature physics
Pest management
Surface science
Transport
Water resources management

Note that these are only a few examples of the many subject areas (other than the seven identified fields) that are eligible for support in the Open Area.

The Open Area is not intended to be a substitute for regular NSERC grant programs and Council expects that it will complement or fill possible gaps in the mechanisms and operation of NSERC, or in the spectrum of research and research-related activities supported by NSERC.

LE THÈME OUVERT

Le thème ouvert est un volet du programme de subventions thématiques dans le cadre duquel le Conseil subventionne des projets de recherche dans des domaines d'intérêt national autres que ceux qui ont été désignés (c.-à-d. alimentation et agriculture, biotechnologie, énergie, matériaux et procédés industriels, océans, télécommunications et informatique, toxicologie de l'environnement).

Deux types de recherches sont admissibles dans le cadre du thème ouvert. D'une part, on considère les recherches visant principalement à l'utilisation, à l'application et au développement ultérieur de connaissances et de compétences acquises, y compris le transfert technologique. D'autre part, on admet aussi les recherches visant principalement au développement général et à la création de connaissances et de compétence dans des domaines précis d'intérêt national (autres que les sept domaines choisis par le CRSNG).

Les recherches doivent relever d'une des deux grandes catégories suivantes:

1. la science et le génie visant à des retombées industrielles et socio-économiques;

2. la science à l'appui de l'intérêt public, c.-à-d. l'application de concepts et de connaissances à des questions d'intérêt public.

Ce volet du programme thématique constitue une invitation du Conseil aux chercheurs universitaires à participer activement à la définition de nouveaux domaines de recherche d'intérêt national en soumettant des propositions innovatrices et intéressantes.

Voici des exemples de domaines de recherche déjà subventionnés dans le cadre du thème ouvert.

Conception et réalisation de nouveaux appareils
Foresterie
Génie biomédical
Gestion des ressources en eau
Lasers
Lutte intégrée contre les insectes nuisibles
Physique des basses températures
Sciences de la terre
Science des surfaces
Transport

Veuillez noter qu'il ne s'agit là que de quelques exemples. De nombreux sujets (autres que les sept thèmes du programme) sont admissibles au domaine ouvert.

Ce thème "ouvert" n'est pas un substitut aux programmes ordinaires du CRSNG, et le Conseil s'attend à ce qu'il vienne combler certaines lacunes ou compléter les mécanismes et le fonctionnement du CRSNG ou la gamme d'activités de recherche ou d'activités liées à la recherche appuyées par le CRSNG.

LIST OF NEW PROJECTS / LISTE DES NOUVEAUX PROJETS

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
1. Biomedical engineering and biochemical studies related to medicine / Génie biomédical et recherche en biochimie reliée à la médecine			
Comtois, P. Ctre de rech. écol. Montréal	Aéromycologie * avec P.M. Foggin (Montréal)	120,000	19
Hudson, J.B. Microbiology British Columbia	Plant thiophenes with antimicrobial activities: exploitation of their therapeutic potential * with G.H.N. Towers (UBC)	100,000	24
Mezey, P.G. Chemistry Saskatchewan	Computer-based drug design and molecular engineering	120,000	30
Stillman, M.J. Chemistry Western Ontario	Study on the renal toxicities of gold and platinum containing drugs: new procedures for the visualization of metal location and the reduction of renal toxicity	150,000	34
St-Pierre, L.E. Chemistry McGill	Development of ingestible cholic acid sorbents for lowering blood cholesterol * with G.R. Brown (McGill)	150,000	35
2. Construction technology / Tecnologies de la construction			
Ballivy, G. Génie civil Sherbrooke	Application de l'émission acoustique à l'évaluation de la dégradation mécanique des liaisons pâte de ciment-roche * avec P.C. Aitcin, C. Roy (Sherbrooke)	135,000	17
Stathopoulos, T. Ctre.-Build. Stud. Concordia	Wind load specifications for buildings	120,000	33
3. Environment protection and management / Protection et gestion de l'environnement			
Kershaw, K.A. Biology McMaster	Modelling the impacts of impoundment on the coastal marshes of Western James Bay * with W.R. Rouse, M.K. Woo (McMaster)	165,000	28

* Total funds committed/Montant total accordé

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
3. Environment protection and management / Protection et gestion de l'environnement			
McBean, E.A. Civil Eng. Waterloo	Strategy formulation for acid rain abatement * with G.J. Farquhar (Waterloo)	126,000	29
Warner, B.G. Earth Sciences Waterloo	Paleobiological and environmental isotope investigation of peat deposits in Ontario * with P. Fritz (Waterloo)	80,000	37
4. Forestry and protection against pests / Foresterie et lutte contre les insectes nuisibles			
Dancik, B.P. Forest Science Alberta	Very early evaluation of conifer family growth at harvest age * R.P. Pharis (Calgary)	120,000	21
Fortin, J.-A. Sciences forestières Laval	Inoculation ectomycorhizienne des plants forestiers * avec C. Camiré, M. Lalonde (Laval)	144,000	23
Kaplan, H. Biochemistry Ottawa	Structure-function relationships in the protein insecticide from B. Thuringiensis	195,000	27
Pharis, R.P. Biology Calgary	Factors affecting sexuality of conifers conebuds for the purpose of promoting precocious and enhanced female conebud & pollen production in seed orchards * with S.D. Ross, J.E. Webber (B.C. Min. of Forest)	78,000	31
5. Geoscience / Sciences de la terre			
Crocket, J.H. Geology McMaster	Potential of uraniferous conglomerates at Elliot Lake, Ont., for by-product platinum group minerals recovery	33,000	20
Spooner, E. Geology Toronto	Archean gold-quartz vein ore deposits; testing a complete genetic solution and exploration lithogeochemistry	225,000	32

* Total funds committed/Montant total accordé

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
6. Instrument development / Conception et mise-au-point de nouveaux appareils			
Fortin, E. Physics Ottawa	Tunable semiconductor lasers	40,000	22
Tulip, J. Electrical Eng. Alberta	Endoscopic laser systems * with M. Cervenan, V. Merchant (Laser Inst.)	155,000	36
7. Transportation / Transports			
Hutchinson, B.G. Civil Eng. Waterloo	Impacts of large trucks on highway transportation * with R. Green, R.C.G. Haas, F.F. Saccomanno, J.H. Shortreed (Waterloo)	142,000	25
8. Other / Autres			
Bandrauk, A.D. Chimie Sherbrooke	Amplification & application of intense ultra-short laser pulses in laser chemistry - amplification & application des pulses de laser à haute intensité & courte durée en chimie laser * avec T.T. Nguyen - Dang (Sherbrooke)	180,000	18
Jamieson, D.G. Phychology Calgary	Speech research environment * with T. Nearey (Alberta)	260,000	26

* Total funds committed/Montant total accordé

SUMMARIES OF NEW PROJECTS / RÉSUMÉS DES NOUVEAUX PROJETS

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH / DOMAINE DE RECHERCHE
(Check one/cocher la case appropriée)

☐ Biotechnology / Biotechnologie	☐ Communications and Computers / Télécommunications et informatique	☐ Energy / Énergie	☐ Environmental Toxicology/ Toxicologie de l'environnement
☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: Ballivy, Gérard

Department/Département: Génie Civil

University/Université: Sherbrooke

Phone number (optional)/N° de téléphone (facultatif):

Title of Project/Titre du projet: Application de l'émission acoustique à l'évaluation de la dégradation mécanique des liaisons pâte de ciment-roche

Ballivy, Gérard
Génie civil
Sherbrooke
(819) 821-7115 ou 7114

Titre: Application de l'émission acoustique à l'évaluation de la dégradation mécanique des liaisons pâte de ciment-roche

Cette recherche concerne l'analyse, à l'aide des techniques d'émission acoustique, du processus de décohésion mécanique, par traction et cisaillement, de liaisons coulis de ciment-roche en se référant particulièrement aux cas rencontrés dans les infrastructures de génie civil (massifs rocheux ou ancrages injectés, bétons à haute résistance). Les essais comprennent l'identification et l'interprétation des signaux acoustiques durant des cas de rupture simple en sollicitation uniaxiale, puis l'extension aux cas réels bi- ou tridimensionnels. L'étude de la décohésion des ancrages injectés lors de la mise en charge, ainsi que des granulats grossiers dans les bétons à haute résistance seront particulièrement étudiés; ces résultats permettront également d'évaluer le comportement des coulis d'étanchéité mis en place dans les massifs rocheux fracturés pour créer des barrières hydrogéologiques permanentes.

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH / DOMAINE DE RECHERCHE
(Check one/cocher la case appropriée)

☐ Biotechnology / Biotechnologie
☐ Communications and Computers / Télécommunications et informatique
☐ Energy / Énergie
☐ Environmental Toxicology/ Toxicologie de l'environnement
☐ Food-Agriculture / Alimentation-Agriculture
☐ Industrial Materials and Processes / Matériaux et procédés industriels
☐ Oceans / Océans
☒ Open / Ouvert LASERS

Name/Nom: BANDRAUK, André D.

Department/Département: Chimie

University/Université: Sherbrooke

Phone number (optional)/N° de téléphone (facultatif): 819-821-7085

Title of Project/Titre du projet: AMPLIFICATION & APPLICATION OF INTENSE ULTRA-SHORT LASER PULSES IN LASER CHEMISTRY - AMPLIFICATION & APPLICATION DES PULSES DE LASER A HAUTE INTENSITE & COURTE DUREE EN CHIMIE LASER.

The efficiency of the amplification of intense ultra-short CO_2 laser pulses is investigated using numerical simulation of the laser equations based on nonperturbative models of molecule-radiation interactions (called dressed molecule). Since the temporal and spatial characteristics of such intense-ultrashort pulses ($\tau \sim 1$ psec, $I \geq 10^{12}$ W/cm^2) are expected to modify laser-induced chemical reactions, numerical simulations are used to investigate the optimization of photodecompositions in terms of these parameters. It is the main goal of the project therefore to optimize pulse amplification and industry related laser induced photochemical reactions in order to benefit from the advantage of the strong coherences inherent in intense laser pulses of very short duration.

Des simulations numériques sont appliquées à l'étude de l'efficacité d'amplification de pulses de laser à CO_2, lesquels pulses sont préparés sous des conditions de très haute intensité ($I \geq 10^{12}$ W/cm^2) et de très courte durée (~ 1 psec). Les simulations sont générées à partir des équations du laser dans un régime nonperturbatif de l'interaction molécule-radiation (modèle de la molécule habillée). Puisqu'on s'attend à ce que les charactéristiques spatiales et temporelles de tel pulses modifient les réactions chimiques au laser, d'autres simulations numériques serviront à examiner l'optimisation des photodécompositions chimiques, d'intérêt industriel, en terme de ces variables. Le but principal de ce projet est donc l'optimisation de l'amplification de pulses de laser et des réactions photochimiques industrielles par les propriétés avantageuses de la cohérence inhérente dans tel pulses de très haute intensité et de très courte durée.

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SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH / DOMAINE DE RECHERCHE
(Check one/cocher la case appropriée)

☐ Biotechnology / Biotechnologie	☐ Communications and Computers / Télécommunications et informatique	☐ Energy / Énergie	☐ Environmental Toxicology Toxicologie de l'environnement
☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: Paul Comtois

Department/Département: Centre de recherches écologiques de Montreal

University/Université: Université de Montréal

Phone number (optional)/N° de téléphone (facultatif): (514) 270-2976

Title of Project/Titre du projet: Aéromycologie

Bien que 71% des allergiques soient sensibles aux spores de moisissures, ce n'est que depuis quelques années que l'on a tenté d'isoler et de caractériser les allergènes des moisissures, et les résultats préliminaires ont montré que les problèmes particuliers associés aux moisissures rendaient cette tâche beaucoup plus difficile que prévu. Le véritable impact des moisissures aéroportées sur les maladies respiratoires, et plus particulièrement l'asthme, demeure donc largement inconnu.

En mettant en commun des recherches cliniques et aérobiologiques, nous comptons jeter un regard nouveau sur les moisissures et répondre aux nombreuses questions soulevées lors des dernières rencontres internationales d'allergologie et d'immunologie, soit:

- définir les liens existants entre la spora atmosphérique intérieure et extérieure;
- préciser la contribution des deux phases distinctes (mycelium et spore) à l'allergologie;
- établir la liste des moisissures allergènes et leur seuil clinique (en spores/m^3);
- comprendre les relations existantes entre les assemblages de moisissures et les éléments de l'environnement qui permettent leur installation et leur croissance;
- caractériser les allergènes responsables de l'action des moisissures.

Les résultats de notre étude permettront d'accroître sensiblement l'efficacité de deux des trois méthodes de traitement actuel: le contrôle environnemental et l'immunothérapie (la troisième étant la pharmacothérapie). En effet, les données actuelles sont trop fragmentaires pour avoir permis une augmentation de la disponibilité et de l'efficacité des traitements par immunosensibilisation. Nos résultats permettront l'isolation et la purification des allergènes, tout en établissant leur activité biologique.

Notre recherche permettrait donc, à court terme, l'usage d'extraits de grande qualité pour le diagnostique, et serait une contribution majeure pour notre compréhension future et le traitement de l'allergie aux moisissures. De plus, en définissant clairement les modalités de l'action de l'environnement sur la dynamique des populations fongiques, notre recherche permettra une prévention efficace de l'allergie lorsqu'elle sera possible.

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH / DOMAINE DE RECHERCHE
(Check one/cocher la case appropriée)

- ☐ Biotechnology / Biotechnologie
- ☐ Communications and Computers / Télécommunications et informatique
- ☐ Energy / Énergie
- ☐ Environmental Toxicology/ Toxicologie de l'environnement
- ☐ Food-Agriculture / Alimentation-Agriculture
- ☐ Industrial Materials and Processes / Matériaux et procédés industriels
- ☐ Oceans / Océans
- ☒ Open / Ouvert

Name/Nom: Dr. James H. Crocket

Department/Département: Geology

University/Université: McMaster University

Phone number (optional) N° de téléphone (facultatif): 416-525-9140 (Ext. 4515)

Title of Project/Titre du projet: Potential of uraniferous conglomerates at Elliot Lake, Ontario for by-product platinum group metals recovery.

Uranium mining in the Elliot Lake area of Ontario recovers the metal from uranium bearing minerals which occur as a minor constituent of coarse grained quartz pebble conglomerates. These sedimentary rocks were deposited some 2.4 billion years ago as gravels in river beds. The concentration of uranium minerals in these sediments is promoted by their high specific gravity which allows their separation from the much lighter minerals that make up the major components of these conglomerates. Along with uranium minerals other minerals of high specific gravity, particularly those of high chemical stability, might also be concentrated. Judging by very similar rocks in South Africa one group of metals that might occur in the conglomerate rocks of the Elliot Lake area are platinum group minerals. If this were the case these minerals could probably be recovered with some additions to the hydrometallurgical milling and refining processes currently used to recover uranium, and thereby constitute an economic by-product. The critical elements are the concentration levels and distribution of the platinum group minerals in the Elliot Lake conglomerates.

Using the South African rocks (Witswatersrand Basin) as guides the Elliot Lake conglomerates can be sampled to test for platinum group mineral concentration in specific areas which are thought to represent the optimal conditions for sediment deposition to concentrate high specific gravity minerals. These samples can be subject to processing in the laboratory to concentrate high specific gravity minerals, and the concentrates can then be analysed for diagnostic platinum group metals by a sensitive analytical method. In this case we use instrumental neutron activation analysis. Thus by sampling of the Denison and Quirke mines we expect to obtain a platinum group element data base which will allow us to assess the potential for economic recovery of these metals as by-products to the uranium mining.

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: Dr. Bruce P. Dancik

Department/Département: Forest Science

University/Université: University of Alberta

Phone number (optional)/N° de téléphone (facultatif): (403)432-4413

Title of Project/Titre du projet: Very early evaluation of conifer family growth at harvest age.

In tree improvement programs, trees with fast growth and other desirable traits are selected and bred with each other. To ensure that these traits are carried to subsequent generations, progeny from these crosses are planted in the field for evaluation. Typi cally, evaluation for fast growth has not been made until after many years (decades, often of field growth). In this study we are attempting to relate very early (three to six month) growth under ideal growing conditions to later growth in the field. Seed that has been stored in a freezer will be obtained from the exact genetic crosses which already have been growing in field plantations for 10 to 30 years. This will allow a retrospective analysis of the correlations between field performance and easy growth under ideal, non-limiting environmental conditions. In addition, we will be examining the physiological basis for such growth differences. Success here might allow additional, or confirmatory methods of predicting "good" and "poor" performance.

If successful, this method would enable forest industry and agencies to save substantial sums of money and time in the progeny evaluation process. Tree breeding programs could progress quickly and managers could gain confidence in decisions made long before the crop trees reached harvestable size and age.

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH / DOMAINE DE RECHERCHE
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- ☐ Biotechnology / Biotechnologie
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- ☐ Food-Agriculture / Alimentation-Agriculture
- ☐ Industrial Materials and Processes / Matériaux et procédés industriels
- ☐ Oceans / Océans
- ☒ Open / Ouvert

Name/Nom: Emery Fortin

Department/Département: Physique

University/Université: Ottawa

Phone number (optional)/N° de téléphone (facultatif):

Title of Project/Titre du projet: Tunable Solid State Lasers

Some crystalline semiconductor compounds of the $A^{II} B_2^{III} X_4^{VI}$ type (A = Zn, Cd or Hg; B = In or Ga; X = S, Se or Te) are investigated as possible tunable laser materials. One member of that family of ternary compounds, $CdIn_2S_4$, has already been demonstrated in our laboratory to display optical gain over a wide bandwidth in the visible spectrum. Other compounds of the same family, because of their analogous energy level structure, are expected to show optical gain as well over other regions of the spectrum. These materials could be the solid state equivalent of organic dye solutions. They could have applications in optical communications and integrated optics.

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH / DOMAINE DE RECHERCHE
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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: J. André Fortin

Department/Département: Sciences Forestières

University/Université: Laval

Phone number (optional)/N° de téléphone (facultatif): (418) 656-2384

Title of Project/Titre du projet: Inoculation Ectomycorhizienne des Plants Forestiers

Titre: Inoculation ectomycorhizienne des plant forestiers destinés au reboisement.

Au cours des dernières années, les recherches effectuées un peu partout dans le monde ont permis de constater que la presque totalité des arbres forestiers vivent en symbiose avec des champignons du sols. Ceux-ci, appartenant en majorité aux champignons supérieurs (Basidiomycètes) arrivent à croître entre les cellules des racines des arbres sans les endommager. Au contraire il est démontré que ces champignons facilitent la nutrition minérale des arbres et les protègent contre certaines maladies. Il semble de plus qu'ils augenteraient la résistance à la sécheresse et que par production d'hormones ils puissent affecter favorablement le métabolisme de l'arbre. Puisqu'il s'agit d'une symbiose, il ne faut pas s'étonner que le champignon tire en retour l'énergie et le carbone dont il a besoin à partir des réserves de l'arbre. Des travaux d'application effectués dans plusieurs pays, et surtout aux Etats-Unis, ont montré que la plantation d'arbres porteurs de mycorhizes connait un meilleur succès dans un nombre appréciable de circonstances. Amélioration de la survie des plants et meilleure croissance de départ. Cependant, les souches utilisées dans ces travaux sont mals adaptées aux sols et aux climats canadiens et les technologies pour la production, l'implantation et la colonisation des racines par les inoculums représente un coût prohibitif.

Ce projet vise 1° à intensifier les travaux déjà amorcés pour sélectionner et améliorer génétiquement des souches particulièrement bien adaptées aux espèces d'arbre, aux sols et aux climats canadiens et 2° à définir les méthodes qui vont permettre d'introduire l'inoculum mycélien, sans support solide, directement sur le système racinaire. 3° à augmenter le pourcentage de survie des plants mycorhizés par raport aux non-mycorhizés d'au moins 5% un an après la plantation.

A l'échelle canadienne ceci pourrait représenter une économie annuelle de $15 ou 25 millions annuellement, selon que les programme de plantation resteront au niveau actuel ou doubleront d'ici 1995.De plus le succès de ce programme permettrait possiblement d'envisager l'exportation d'une technologie canadienne.

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH / DOMAINE DE RECHERCHE
(Check one/cocher la case appropriée)

- ☐ Biotechnology / Biotechnologie
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- ☐ Environmental Toxicology / Toxicologie de l'environnement
- ☐ Food-Agriculture / Alimentation-Agriculture
- ☐ Industrial Materials and Processes / Matériaux et procédés industriels
- ☐ Oceans / Océans
- ☒ Open / Ouvert

Name/Nom: J.B. HUDSON.

Department/Département: MEDICAL MICROBIOLOGY, BOTANY

University/Université: UNIVERSITY OF BRITISH COLUMBIA

Phone number (optional)/N° de téléphone (facultatif):

Title of Project/Titre du projet: PLANT THIOPHENES WITH ANTIMICROBIAL ACTIVITIES: EXPLOITATION OF THEIR THERAPEUTIC POTENTIAL

There is a need for better methods of chemotherapy to combat microbial infections, especially those caused by viruses, fungi and parasites. We have recently studied a group of plant chemicals, called thiophenes, which are extremely potent anti-microbial compounds. We plan to test their efficacy in mice which have been experimentally infected with a virus. The chemicals will be administered to the infected mice either directly or by means of innovative techniques for targeting the chemicals specifically to the test virus.

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- ☐ Industrial Materials and Processes / Matériaux et procédés industriels
- ☐ Oceans / Océans
- ☑ Open / Ouvert

Name/Nom: Bruce Hutchinson

Department/Département: Civil Engineering

University/Université: University of Waterloo

Phone number (optional)/N° de téléphone (facultatif): (519) 885-1211 Ext. 2620

Title of Project/Titre du projet: Impacts of Large Trucks on Highway Transportation

Trucks carry the majority of the commodities transported in Canada except for the low-value, high-volume, point-to-point primary resource movements. Fabricated materials and end-products account for some 80% of the commodities moved by trucks and these are transport cost and delivery time sensitive. Eighteen percent of the commodities moved by trucks are classified as dangerous goods by the Canadian Transport Commission and a large portion of the deaths and injuries resulting from dangerous goods accidents involve trucks.

Strong competition within the trucking industry and with other modes of transport have led to substantial increases in legal vehicle weights and dimensions. There are many who believe that some of these regulatory changes have been in response to industry pressures and not as a consequence of technico-economic analyses. Others feel that distortions exist in the freight transport market because the user fees paid by trucks do not cover the additional highway and maintenance costs required to accommodate large trucks.

The results of a Heavy Vehicle Weights and Dimensions Study conducted by the Roads and Transportation Association of Canada and funded by the provincial and Federal governments and the trucking industry are to be made available to researchers in August, 1986. The information base will include the results of a large number of field tests on vehicle stability and control and on truck load impacts on pavements. The research project plans to integrate this new information base with existing data and to use this knowledge to conduct a comprehensive technical assessment of (1) the impacts of large trucks on highway pavement requirements, (2) the impacts of new truck configurations on highway bridge design requirements, (3) the adequacy of the safety standards that underly the current geometric design standards used across Canada, (4) the relationship between vehicle weights and dimensions and the frequency and severity of accidents involving trucks, (5) the impacts of large trucks on the traffic carrying capacities of highways, and (6) the impacts of proposed changes in vehicle weights and dimensions on the economics of truck transport.

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- ☐ Industrial Materials and Processes / Matériaux et procédés industriels
- ☐ Oceans / Océans
- ☒ Open / Ouvert

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University/Université: Calgary

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Title of Project/Titre du projet: Speech Research Environment

Speech technology (e.g., synthesis, messaging, text-to-speech, speech enhancement, speech recognition, speaker identification) is now widely incorporated into products for the consumer, military, industrial and educational markets. The engineering and computing side of the technology has advanced so quickly that such applications are now limited primarily by our poor understanding of the acoustic and perceptual factors which underly speech intelligibility, naturalness, and recognition.

Outside of Canada, the funding of significant research projects is accelerating through project and program grants to support speech research centers at many universities in the United States, England, France, and elsewhere. Such investments reflect an awareness of the economic and social impact which advances in speech technology are bringing, together with a sense that significant advances will accompany the application of modern digital signal processing techniques.

Speech research is costly and technically demanding, but the payoffs are high. Major private industries establish speech research facilities because the potential returns are so significant, but the research base remains small since most university and clinical researchers are now effectively excluded, together with most smaller companies. One example of important, non-Canadian proprietary developments is new work on speech synthesis by rule, which has a clear impact on the quality of speech and thus on user acceptance.

The slow growth of knowledge about the most important means of human communication has special importance for Canada: 1) the distances between research facilities are enormous; 2) our small research budgets have precluded additional speech research facilities; 3) because of distance, we have a unique reliance on long-distance communication; 4) we have special speech/language training needs because we are a bilingual country, with a high rate of immigration. This proposal represents a particularly cost-effective approach to increasing the base of our knowledge about speech, by placing a reliable, powerful, efficient, and affordable integrated speech research workstation in the hands of large numbers of capable and interested researchers.

Building upon the investigators' previous experience with speech research using larger computers, the project will develop a powerful but affordable speech research workstation (henceforth SRW). The SRW would bring speech capture, analysis, synthesis, manipulation, and output to the desktop of individual speech researchers, freeing those researchers from their current dependence upon the limited number of costly, specialized speech research facilities built around minicomputers and superminicomputers. The SRW will be inexpensive to establish (≤$7,000) and to maintain, it will use powerful, proven technology, it will include the desired functions in a single, integrated system, and it will be interactive, to improve the efficiency with which speech research is done. The resulting increment in research should have important implications for the applied problems of speech synthesis, speech recognition, language learning, and hearing and speech disorders. By coordinating development efforts into a single, integrated SRW, the inefficiencies of a large number of similar but incompatible, small-scale projects will be avoided, and a vastly superior product will be available.

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☐ Food-Agriculture Alimentation-Agriculture	☐ Industrial Materials and Processes Matériaux et procédés industriels	☐ Oceans Océans	☒ Open Ouvert

Name/Nom: Harvey Kaplan

Department/Département: Biochemistry

University/Université: of Ottawa

Phone number (optional)/Nº de téléphone (facultatif): 564-5872

Title of Project/Titre du projet:
Structure-Function Relationships in the Protein Insecticide from B. thuringiensis

The proposed research concerns a protein produced by a particular bacterium. This protein is completely innocuous to all living organisms except certain insect larvae. When ingested by these insect larvae the protein is converted to a toxin which kills the caterpillar. Its attractiveness as an environmentally safe insecticide for pest control is limited by several problems. One of these is the fact that the protein is rapidly destroyed by sunlight and loses its ability to kill caterpillars. This proposal is concerned with finding out how sunlight destroys the protein. Knoweldge of this process will be used to develop ways of overcoming or neutralizing the effect of sunlight. If successful, this research will provide a more cost-effective insecticide which will enable it to compete in the marketplace with chemical insecticides, some of which are environmentally questionable. Another benefit of this research will be that the scientific information obtained will provide others with a basis for developing more potent protein-based insecticides against a wider range of pests. Since Canada is a major user of insecticides in forestry and agriculture, development of a safe, cheap, natural insecticide is of environmental and economic importance.

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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: Dr. K.A. Kershaw

Department/Département: Biology

University/Université: McMaster University

Phone number (optional) / Nº de téléphone (facultatif): (416) 525-9140 Ext. 4265

Title of Project/Titre du projet: Modelling the impacts of impoundment on the coastal marshes of Western James Bay.

The proposed impoundment of James Bay, associated with the Grand Canal concept, is a mega-project on a scale never before attempted. The undertaking of this project without sufficient knowledge, presents the strong possibility of an ecological disaster due to destruction of the marshes of western James Bay. Since these marshes form a major feeding ground for migratory and non-migratory birds the impacts would affect sports hunting, but most especially, would severely hurt the native peoples of western James Bay for whom huntings is a way of life.

This proposal is to develop a numerical model to predict the effects of the impoundment of James Bay on the coastal marshlands using various scenarios of water-level changes, salinity changes and temperature changes. The model will start with the impoundment of James Bay and through submodels predict the impact on energy and water inputs to the marsh, the impact on water and salt fluxes in the marsh and finally the overall impact on vegetation growth and successional changes.

The applicants have collaborated extensively, and all have considerable research experience relating to the James Bay and Hudson Bay Lowlands. We have researched most of the fundamental relationships which will allow the successful development of a model. With further limited research in north-western James Bay, we are in a unique position to achieve this goal.

Because our model can be used to predict this very important environmental impact it will be useful to the native people who will be most directly affected, to the Ministry of the Environment (Provincial and Federal) who need to know the impact and to the Grand Canada Co. which can then plan to minimize harmful effects.

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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: Edward McBEAN

Department/Département: Civil Engineering

University/Université: University of Waterloo

Phone number (optional)/N° de téléphone (facultatif): 519-885-1211, Extension 3349

Title of Project/Titre du projet: Strategy Formulation for Acid Rain Abatement

Acid deposition is an acknowledged detriment of large scale emission of sulfur and nitrogen compounds. The resulting environmental, health and physical disbenefits dictate that major emission reduction strategies must be investigated and instituted across North America. A detailed optimization model will be refined to minimize the costs of emission reductions to meet set environmental standards. Much of the effort will be directed at reducing uncertainty levels in key physical parameters: point and areal source cost-removal functions; source-receptor linkages; and, optimal configuration of the receptor matrix. The model refinements will incorporate recent advances in probability representation of input parameters. Alternative abatement policies that reflect management strategies/conflict analysis will be developed. The model will be applied to evaluate various management strategies for a number of meteorological/emission seasons and years.

The long term impact of deposition levels associated with evaluated management strategies will be assessed with the Waterloo Infiltration and Chemical Kinetics (WICK) model, a soil-chemical model developed at the University of Waterloo.

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- ☐ Food-Agriculture / Alimentation-Agriculture
- ☐ Industrial Materials and Processes / Materiaux et procedes industriels
- ☐ Oceans / Oceans
- ☒ Open / Ouvert

Name Nom: Paul G. Mezey

Department Departement: Department of Chemistry

University Universite: University of Saskatchewan

Phone number (optional) No de telephone (facultatif): (306) 966-4661

Title of Project Titre du projet: **Computer-Based Drug Design and Molecular Engineering**

The current revolutionary innovations in computer hardware, the availability of powerful desktop computers, vector processing and parallel processing on a large scale are opening the door for new applications, and one applied field that is bound to evolve is a computer-based approach to quantum chemical synthesis design. In particular, the development of novel QSAR (Quantitative Structure-Activity Relationship) techniques for drug design and molecular engineering, based on the detailed electronic and stereochemical properties of molecules will benefit from advances made in computer technology.

The research project is based on a new mathematical-computational method for the precise characterization of shapes of electronic charge distributions, and electrostatic potentials. A concise shape description is given in terms of algebraic shape groups, determined by the computer form calculated electron distribution of molecules. These shape groups are somewhat reminiscent to molecular symmetry groups, but they are independent of molecular symmetry, in fact, these shape groups are equally descriptive and applicable for both symmetric and asymmetric molecules.

The goals of the project are:

(i) Development and application of methods for rigorous computer-based comparison of molecular shapes, shapes of charge distributions and electrostatic potentials, using symmetry-independent shape groups.

(ii) Efficient extraction of essential shape features, as represented by algebraic relations.

(iii) Possible extensions to provide a rigorous test and analysis of chirality properties by computer, without visual inspection or graphics manipulation, using a family of chirality polynomials discovered in 1985.

(iv) Computer scanning of large families of molecules in search for candidates with desired shape, charge density, eletrostatic potential, chirality, or other three dimensional properties.

(v) Reduction of the number of molecules needed to be tested experimentally. (e.g., from 1000 analogues of active compound X test experimentally only the 20 candidates scoring highest on the computer test).

Japan, USA, Western and Eastern Europe are making exceptional effort to modernize pharmaceutical research. In Canada only few companies are involved in product development in this field. The new federal pharmaceutical patent regulations and a potential free trade agreement with USA provide strong motivation for new initiatives and sustained research in QSAR.

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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: Richard P. Pharis

Department/Département: Biology Department

University/Université: University of Calgary

Phone number (optional)/No de téléphone (facultatif): 403-220-5259

Title of Project/Titre du projet:

Factors affecting sexuality of conifers conebuds for the purpose of promoting precocious and enhanced female conebud & pollen production in seed orchards

Research on the 'determination of sex' in the flowering of commercially important Canadian species of conifers is proposed. If successful there will be an immediate impact on the breeding of trees for 'genetic superiority'. Now, early (precocious) induction of pollen conebuds (male) cannot be readily accomplished for many conifer species. Also, the ability to manipulate sex in older seed orchards (field, or container-grown) will allow orchard managers to increase the proportion of female flowering, thereby increasing the yield of genetically superior seed from each seed orchard tree.

Our knowledge of how sex is determined in conifers of the Pinaceae family (which contains species of the greatest commercial importance) is presently quite rudimentary. Hence, successful results will add to the basic knowledge of sexuality in conifers, a group of higher plants that receives very little attention from physiological/biochemical research scientists.

The sex of conebuds on a conifer can sometimes be manipulated, depending upon the species, with some success by taking advantage of daylength or stage of shoot development (i.e., lengthening days can increase male conebud production, shortening days female conebud production for some species). There are also positional factors (top of the tree almost always produces female, bottom of the tree produces male). These two factors will be the key tools by which we can manipulate or predict conebud (flower) sex for investigative purposes. Flowering per se will be induced either by application of gibberellin A4/7 mixture (GA4/7), or by adjunct cultural treatments (e.g., water stress, high temperature), or by their combination.

Potential conebud primordia thus induced will be examined at several very early stages of differentiation for endogenous hormone level (i.e., auxin, GA, possibly cytokinin) using definitive analytical methods including gas chromatography-selected ion monitoring (GC-SIM) with stable isotope internal standards, bioassay, and properly validated immunoassay techniques. Past research has implicated an auxin (most likely IAA, indole-3-acetic acid) within the tree as possibly being responsible for the gradient in sex observed from top to bottom of the tree.

Based on analytical results from experiments noted above, it is expected that we may be able to design appropriate hormone mixtures (in which the auxin:GA4/7 ratio is modified). These hormone mixtures, when applied at optimal times using appropriate application techniques, would allow tree breeders and seed orchard managers to successfully induce early (precocious) male flowering, and increase the proportion of female flowering in older seed orchards.

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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert Geosciences

Name/Nom: E.T.C. Spooner

Department/Département: Geology

University/Université: University of Toronto

Phone number (optional) N° de téléphone (facultatif): (416) 978-3022

Title of Project/Titre du projet: ARCHEAN GOLD-QUARTZ VEIN ORE DEPOSITS; TESTING A COMPLETE GENETIC SOLUTION AND EXPLORATION LITHOGEOCHEMISTRY

The Canadian mining industry accounts for an impressive 1/5th of this country's total export earnings, employs more than 300.000 people, operates particularly in northern parts of the country, and also world-wide, has been very successful in discovering new gold ore deposits recently, is largely Canadian owned and operated, and is therefore a powerful instrument of Canadian economic independence. Gold is Canada's #4 metal in production value at C$1.2 billion (1984 figure) and accounted for a large proportion of the ~ $420 million spent on mineral exploration in 1984.

The overall objective of this research is to provide geochemical exploration data and geological concepts which will be of direct use in finding new mines in Canada with all the associated employment, wealth and tax creating benefits. This objective will be fulfilled by (i) testing a new genetic solution proposed by my research group for the origin of the most important type of gold deposit in the country, which has considerable geological implications for exploring for Renabie-type Au deposits (e.g. Renabie itself at 5.5 million tonnes, ~ 6 g/tonne Au and ~2 g/tonne Ag ≈ $0.5 billion), and (ii), as a logical consequence, defining values for geochemical parameters for rating igneous intrusions as having zero, low, medium, high or very high Au potential. The latter data will be used by company personnel economically evaluating mineral properties on a routine basis. The research will concentrate on the Lamaque and North Pascalis Au deposits in the Val d'Or area of Quebec, on comparing these deposits with the Renabie deposit near Wawa in Ontario on which research is already in progress, on the Wawa domal tonalite gneiss-granodiorite-quartz monzonite terrane in the Chapleau area of Ontario, on the Canuc Resources Au property near Coronation Gulf in the N.W.T., and on intrusions associated (anomalous geochem. values) and not associated (background values) with Au mineralization throughout Quebec and Ontario.

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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: STATHOPOULOS, Theodore

Department/Département: Centre for Building Studies

University/Université: Concordia

Phone number (optional) N° de téléphone (facultatif): (514)848-3186

Title of Project/Titre du projet: Wind Load Specifications for Buildings

The proposed work consists of the development of codified wind loads appropriate for buildings of intermediate height and low buildings of different shapes (mono-sloped, folded, saw tooth, stepped roofs). The National Building Code of Canada and its Supplement currently lack of specifications for such buildings and this creates problems related to safety and economy of design.

The methodology of this project will be experimental and will consist of systematic testing of several building configurations in the boundary layer wind tunnel of the Building Aerodynamics Laboratory of the Centre for Building Studies. Both local pressures and area-averaged wind loads acting on the envelope of building models will be measured by monitoring their statistics (extreme peaks, mean and root-mean-square values) for a number of wind directions. An open country terrain (exposure A) will be simulated in the wind tunnel for the measurement of wind loads on low buildings whereas both open country and urban terrains (exposures A and C) will be simulated for the measurement of wind loads on buildings of intermediate height. The collected data base will be codified, i.e. will be presented in a form of limited number of charts and rules appropriate for incorporation within a code or standard.

The outcome of the proposed work is expected to have significant ramifications in the design of cladding and structural elements of buildings in terms of safety and economy. The introduction of new wind load specifications for low buildings with gabled roofs in the National Building Code of Canada (1980, 1985) has saved the low-rise construction industry in Canada 16.9 million dollars annually. The impact of this project will be much more significant because of its extensive coverage of building geometries.

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- ☐ Oceans / Océans
- ☒ Open / Ouvert

Name/Nom: Dr. M. J. Stillman

Department/Département: Department of Chemistry

University/Université: The University of Western Ontario

Phone number (optional) N° de téléphone (facultatif): (519) 679-2931

Title of Project/Titre du projet: Study on the renal toxicities of gold and platinum containing drugs: new procedures for the visualization of metal location and the reduction of renal toxicity.

The platinum-containing, anticancer drugs and gold-containing, anti-arthritis treatment drugs, have significant therapeutic value. However, the toxic side effects seriously limit the maximum doses that may be administered. Amoungst sites for permanent damage if high dose levels are used, are the kidneys. This proposal concerns the development of a regimen that induces synthesis of the metal-binding protein, metallothionein in the kidneys to reduce damage caused by these drugs. A major component in this study will be the development of an imaging procedure that can be used to locate and quantify the platinum and gold bound to metallothionein within the kidney tissues.

Absorption, circular dichroism, magnetic circular dichroism and emission spectra will be used to determine the stoichiometry and domain-specificity of gold and platinum binding to metallothionein *in vitro*. Titrations with sub-mole equivalents of the different metal complexes will be followed using circular dichroism spectra as a sensitive monitor of speciation. The imaging of tissue samples will be developed initially with the luminescent copper-containing metallothionein. The new technique will allow for the visualization of this protein within the livers of animals using a fluorescence microscope. Isomorphous replacement of zinc in Zn-MT by copper(I) will be carried out to obtain imaging in kidney tissue. The procedure will be extended to Au-MT and Pt-MT formed both *in vitro* in the tissue, and *in vivo* following pretreatment with a metallothionein indcuing agent. The location of the Au-MT and Pt-MT will be related to the renal toxicities of these compounds. The efficacy of the pretreatment regimen in forming the metallothionien complexes will be related to the observed reduction in toxicity of the compounds.

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Name/Nom: Leon E. St-Pierre and G. Ronald Brown

Department/Département: Chemistry

University/Université: McGill

Phone number (optional)/N° de téléphone (facultatif): 514-392-4451

Title of Project/Titre du projet:
Development of Ingestible Cholic Acid Sorbents forLowering Blood Cholesterol.

A team of scientists at McGill University have discovered a family of polymers which give promise as a medication aimed at lowering the incidence of heart attacks among middle aged males. The work is being funded by The Natural Science and Engineering Research Council.

Recent studies carried out on several thousand middle aged males in Canada and the United States have shown that coronary heart disease is strongly linked to blood cholesterol levels. A twenty percent rise in those levels can result in nearly doubling the incidence of heart atacks.

Cholesterol levels can be lowered by the ingestion of non digestible, bio-compatible materials which can remove cholic acid from the intestine. This acid is related to the levels of cholesterol in the blood and when it is removed the cholesterol levels are dropped.

The McGill work, led by Drs. L. E. St-Pierre and G. Ronald Brown, has demonstrated that polymers based on materials related to proteins can remove cholic acids. Animal testing will commence in thé near future. Success in this work gives promise not only of treating heart attack victims, but of providing a preventive medication.

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☐ Food-Agriculture / Alimentation-Agriculture	☐ Industrial Materials and Processes / Matériaux et procédés industriels	☐ Oceans / Océans	☒ Open / Ouvert

Name/Nom: JOHN TULIP

Department/Département: ELECTRICAL ENGINEERING

University/Université: UNIVERSITY OF ALBERTA

Phone number (optional)/N° de téléphone (facultatif): (403) 432-5149

Title of Project/Titre du projet: ENDOSCOPIC LASER SYSTEMS

The endoscope is a medical instrument used for internal viewing of the body. This diagnostic innovation has revolutionized the practice of medicine by some medical specialists. Combining laser fibreoptics with the endoscope offers the possibility of adding noninvasive surgical intervention to its current uses as a diagnostic tool.

In this proposal we are requesting funding to develop a fibreoptic coupled NdYAG laser which will both cut and coagulate tissue. With this device, a surgeon could, for example, burn away obstructions in a patient's airway through a bronchoscope thereby avoiding open surgery. Should complications arise due to blood loss, the NdYAG laser could coagulate the leaking vessel endoscopically.

The ability of the NdYAG laser to coagulate tissue is well known. In small scale laboratory experiments we have demonstrated our technique which allows tissue cutting using the NdYAG laser.

This grant application would support the instrumentation of this technique into a hospital device which could then be used for clinical assessment of the laser.

SUMMARY FOR PUBLICATION/RÉSUMÉ À PUBLIER

FIELD OF RESEARCH DOMAINE DE RECHERCHE
(Check one/cocher la case appropriée)

- ☐ Biotechnology / Biotechnologie
- ☐ Communications and Computers / Télécommunications et informatique
- ☐ Energy / Énergie
- ☐ Environmental Toxicology/ Toxicologie de l'environnement
- ☐ Food-Agriculture / Alimentation-Agriculture
- ☐ Industrial Materials and Processes / Matériaux et procédés industriels
- ☐ Oceans / Océans
- ☒ Open / Ouvert

Name/Nom: B. G. Warner and P. Fritz

Department/Département: Earth Sciences

University/Université: University of Waterloo

Phone number (optional) N° de téléphone (facultatif): (519)-885-1211 ext. 6330 and ext. 3236

Title of Project/Titre du projet: Paleobiological and Environmental Isotope Investigation of Peat Deposits in Ontario.

Next to the Soviet Union, Canada contains the most extensive peat deposits in the world. Peat and peatlands are used for fuel, agriculture, forestry, horticulture, and in the manufacturing industry (i.e. charcoal filters, medicine, oil absorbing materials). The time has come for Canada to develop major programmes to the evaluate the amount of, modes of extraction and regenerative capacities of peatlands for effective management.

Our studies concentrate on assessing the role of climate, hydrology and vegetation composition and the developmental history of selected peatlands in Ontario. Fossils preserved in the peat, pollen, seeds, testate amoebae (Protozoa), algae and geochemical techniques can be used to reconstruct past developmental trends. These trends can be extrapolated into the future to understand how the peatland might change due to drainage clearance, peat extraction or fertilization. It is necessary to understand how the peatland might respond in order to ensure renewed peat growth and the perpetuation of the peat supply.

Many of the best peatlands that could be used for such purposes exist near large markets and labour supplies, thereby reducing costs to the consumer. However, urbanization, pollution, human impact and general mismanagement continue to threaten such potential peat supplies and peatlands. Future activities will only threaten more such peatlands, and even those peatlands in more remote regions of the country until efficient management programmes are initiated for all concerned as soon as possible.

LIST OF ONGOING RESEARCH PROJECTS / LISTE DES PROJETS DE RECHERCHE EN COURS

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
1. Biochemical studies related to medicine / Recherche en génie biomédical reliée à la médecine			
Szarek, W.A. Chemistry Queen's	Development of systems for the targeted delivery of drugs with applications in cancer chemotherapy * with W.T. Depew, G.W. Hay (Queen's)	255,000	
2. Environment protection and management / Protection et gestion de l'environnement			
Baril, M. Physique Laval	Identification des aérosols atmosphériques acidifiants et détermination de leurs origines	180,000	
Hileman, O.E. Chemistry McMaster	Radium sorption and dissolution in uranium mills and receiving waters * with W.J. Snodgrass, H.D. Grundy (McMaster)	165,000	
Howard, K.W.F. Physical Sciences Toronto	Impact of urban development on groundwater quality	94,460	
Karasek, F.W. Chemistry Waterloo	Study of formation of toxic organic compounds in energy producing municipal incinerators	135,100	
Langford, C.H. Chemistry Concordia	Photocatalysts for waste treatment	96,340	
MacKay, D. Chemical Eng. Toronto	Computer models of organic pollutant behaviour	88,500	
Peters, R.H. Biology McGill	Prediction of littoral production and biomass in recreational Canadian lakes * with J. Kalff, W.C. Leggett (McGill) J.A. Downing (Montreal)	105,000	
Ritchie, J.C. Life Sciences Toronto	A pollen-monitoring network in southern Ontario to trace air-mass sources	41,800	

* Total funds committed/Montant total accordé

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
2. Environment protection and management / Protection et gestion de l'environnement			
Rousselle, J. Génie civil École Polytechnique	Modélisation statistique et régionalisation des caractéristiques de crues au Canada * et collaborateurs	276,000	
Schiff, H.I. Chemistry York	Measurement of gases related to air pollution * with D.R. Hastie (York)	204,000	
Schwarcz, H.P. Geology McMaster	Stable isotopic tracing of sources of acid rain * with J.R. Kramer (McMaster)	80,000	
3. Forestry and protection against pests / Foresterie et lutte contre les insectes nuisibles			
Ayer, W.A. Chemistry Alberta	Phytochemical investigation of important forest diseases. Blue stain fungi associated with the mountain pine beetle * with Y. Hiratsuka (Alberta)	201,000	
Borden, J.H. Biolog. Sciences Simon Fraser	Semiochemicals for forest insect pests * with K.N. Slessor, A.C. Oehlschlager (SFU)	300,000	
Lechowicz, M.J. Biology McGill	The physiological ecology of stress in hardwood trees: resource limitations and the susceptibility of seedlings to pests and pathogens	90,000	
Schoen, D.J. Biology McGill	The genetic efficiency of a clonal seed orchard	120,000	
Weetman, G.F. Forest Science British Columbia	Growth and stand density of lodgepole pine based on the -3/2 power rule of self-thinning	120,000	
Wein, R.W. Fire Science Crte. New Brunswick	Analytical geographic information tools for natural resource and fire management in the northern boreal forest * with S.E. Masry, E.E. Derenyi, F.R. Steward, E.W. Robak, I.R. Methven (UNB)	300,000	

* Total funds committed/Montant total accordé

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
4. Geosciences and mining engineering / Sciences de la terre et génie minier			
Cherry, J.A. Earth Sciences Waterloo	Hydrogeologic properties and contaminant mobility in fractured clayey deposits * with J.F. Barker, M.B. Dusseault, S.K. Frape, E.O.Frind, P. Fritz, R.W. Gillham, E.J. Reardon (Waterloo)	405,000	
Kerrich, R. Geology Western Ontario	Hydrothermal aluminous minerals: a guide in ore deposits exploration * with R.W. Hodder (UWO)	150,000	
Young, R.P. Geological Science Queen's	Rock burst investigations using concurrent tomographic imaging and acoustic emission techniques * with D.A. Hutchins (Queen's)	180,000	
5. Instrument development / Conception et mise-au-point de nouveaux appareils			
Hall, L.D. Chemistry British Columbia	Strategic application of chemical microscopy	180,000	
Hubert, J. Chimie Montréal	Nouvelle instrumentation pour analyse multiélémentaire * avec M. Moison (Montréal)	134,200	
Jones, H.W. Eng. Physics Tech.Univ. N.S.	An ultrasonic tomographic medical diagnostic instrument * with J. Aldrich (Cancer Clinic and Res. Foundation),S. Jackson, D. White, J. Filbee (Dalhousie)	171,320	
Nicholls, R.W. Physics York	Field studies on atmospheric SO2 and other gases with a new digital gas filter correlation spectrometer (gascoscan)	208,200	
Reid, J. Eng. Physics McMaster	Development of new lasers and electro-optic devices * with P.E. Jessop, B.K. Garside (McMaster)	395,600	

* Total funds committed/Montant total accordé

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
5. Instrument development / Conception et mise-au-point de nouveaux appareils			
Savoie, R. Chimie Laval	Fourier transform Raman spectroscopy * avec M. Pezolet (Laval)	120,000	
Weingartshofer, A. Physics St. F. Xavier	Collision processes in the presence of intense laser fields * with E.J. McAlduff, D. Klapstein (St. F. Xavier)	56,500	
6. Transportation / Transport			
Haas, R. Civil Engineering Waterloo	Development of technology for geogrid reinforcement of roads and allied structures * with L. Rothenburg, B. Leliêvre, E.L. Matyas (Waterloo), A.P.S. Selvadurai, D.Abd El Halim, G.E. Bauer (Carleton)	180,000	
Habashi, W.G. Mechanical Eng. Concordia	Finite element Navier-Stokes applications package (FENSAP)	150,000	
Rousseau, J.M. Infor. & rech opér. Montréal	HOTOCARS: un logiciel pour l'élaboration des horaires et tournées de véhicules assistée par ordinateur - computer aided vehicule routing and scheduling system * avec J.A. Ferland, G. Lapalme (Montréal)	300,000	
Sankar, S. Mechanical Eng. Concordia	Computer-aided design (CAD) and interactive graphics in vehicle systems	144,800	
7. Other / Autres			
Dolphin, D. Chemistry British Columbia	Synthesis and properties of new liquid crystal systems * with R.E. Pincock (UBC)	110,000	
Jones, W.E. Chemistry Dalhousie	Surface chemistry and physics * with H.J. Kreuzer, P.D. Pacey, D.W.J. Geldart (Dalhousie)	165,000	

* Total funds committed/Montant total accordé

LIST OF SUMMARIES OF COMPLETED PROJECTS /

LISTE DES RÉSUMÉS DES TRAVAUX DE RECHERCHE TERMINÉS

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
1. Biomedical engineering and biochemical studies related to medicine / Génie biomédical et recherche en biochimie reliée à la médecine			
Ghista, D.. Mechanical Eng. McMaster	Comprehensive assessment of cardiac pumping function in terms of intra-left ventricular blood flow velocity and differential pressure distribution derived from cineangiograms	50,000	55
St-Pierre, L.E. Chemistry McGill	The development of specific polymer sorbents for removal of bilirubin from plasma * with G.R. Brown, W.C. Galley (McGill)	120,000	59
2. Environment protection and management / Protection et gestion de l'environnement			
McBean, E.A. Civil Engineering Waterlooo	Design of acid rain abatement strategies incorporating uncertainty * with G.J. Farquhar (Waterloo)	78,600	56
3. Forestry and protection against pests / Foresterie et lutte contre les insectes nuisibles			
Dumbroff, E.B. Biology Waterloo	Drought tolerance and physiological mechanisms of planting stock * with J.E. Thompson (Waterloo)	90,000	54
Pharis, R.P. Biologyer Calgary	Tree improvement: anatomical, physiological and biochemical approaches to obtaining early and enhanced seed production in conifers * with J.N. Owens (Victoria)	210,000	57
Withers, S.G. Chemistry British Columbia	Glycosidase inhibitors as anti-fungal agents and wood preservatives * with D. Dolphin (UBC)	80,000	60

* Total funds awarded/Montant total accordé

Open / Ouvert

Name/Nom Department/Département University/Université	Title/Titre	$*	Page
4. Geosciences / Sciences de la terre			
Dimroth, E.D. Géologieal Québec-Chicoutimi	Modélisation des évolutions géologiques et métallogéniques de la ceinture Abitibi * avec Y. Héroux, K. Schrijver (Qué-INRS), M. Rocheleau (Laval), G. Archambault, J. Carignan, E.H.M. Chown, J. Guha (Qué-Chicoutimi), N. Goulet (Qué-Montréal)	213,400	53
5. Instrument development / Conception et mise-au-point de nouveaux appareils			
Cheeke, J.D.N. Physique Sherbrooke	Microscopie acoustique * avec F. Guillon, M. Poirier (Sherbrooke)	74,500	52
Séguin, H.J.J. Electrical Eng. Alberta	Glow discharge stabilization with magnetic fields * with C.E. Capjack (Alberta)	150,000	58
6. Transportation / Transports			
Brussell, E.M. Psychology Concordia	The influence of perceptual cue interactions on the fidelity of aircraft simulators * with M.K. Komoda (Concordia), L.D. Reid (Toronto), A. Delorme, J. Frigon (Montréal), G.M. McKinnon, S.R. Stober, B. Welch (CAE Electronics Ltd. Montreal)	323,500	51

* Total funds awarded/Montant total accordé

REGULATIONS GOVERNING THE USE OF GRANT FUNDS
(Excerpts from the 1986-87 Awards Guide) /

RÈGLEMENTS RÉGISSANT L'UTILISATION DES SUBVENTIONS
(extraits du Guide des subventions 1986-1987)

Name/Nom: Edward M. Brussell, Ph.D.
Department/Département: Department of Psychology
University/Université: Concordia University
Phone number(Optional)/N° de téléphone (facultatif): (514) 848-2206
Title of Project/Titre du projet: The Influence of Perceptual Cue Interactions on the Fidelity of Aircraft Simulators.

Due to the high cost of training pilots, aircraft simulators have come to play an increasingly important role in the commercial and military aviation sectors. The ability to manufacture an effective simulator depends upon how well one can recreate the physical enviornment of a given aircraft (i.e., objective fidelity), and the experience of flight (i.e., perceptual fidelity). The degree of success in achieving objective fidelity is beyond question. However, problems still exist in the realm of perceptual fidelity that may be overcome by giving consideration to the way in which the human nervous system processes the information given by the available perceptual cues.

For example, we have determined that a class of visual distortions can occur due to the fact that display devices mimic real motion by generating successive, discrete images at a rapid rate. Under certain conditions of stimulation, our research indicates that a number of the separate images can be stored in the brain simultaneously producing illusory percepts ranging from multiple images seen moving smoothly across the display, to single images with pattern distortions within them. A common manifestation of this problem is a perceived breakup of the horizon during a simulated roll maneuver. This class of distortions can be reduced or eliminated with the use of high luminance displays, and a sacrifice of some spatial resolution.

Visual cues alone can also induce the sensation of self-motion (i.e., vection). This is a desireable state since it will reinforce the illusion of flight. In fact, in simulators that are not equipped with motion platforms, vection is the only cue that can provide the feeling that one is actually moving. Data from this project indicate that the magnitude of vection is generally greatest for slow visual motion of large extent. Wider displays, as well as additional motion moving from the top to the bottom of a display (e.g., the way in which the ground appears to move when viewing through the pilot's window while the aircraft is in flight), also increase the sensation of illusory self-motion. In general, our results concerning vection can be used to enhance the illusion of flight in aircraft simulators.

Those simulators that are equipped with a motion platform can also provide cues to acceleration. However, this is information is constrained by the fact that the platforms can only move through a limited range. Thus during a simulated take-off, for example, the forward motion must be gradually eliminated, the platform must be returned to its starting position, and the forward motion must be gradually reintroduced. A critical aspect of these procedures is that the "wash out", "return", and "wash in" motions must not be noticed by a pilot. Therefore we also studied a principal means of lowering a pilot's sensitivity to unwanted motion: the addition of a low level of background noise superimposed on the real motion. The data from these experiments revealed that: a) noise is equally effective at lowering sensitivity to motion over a wide range velocities, b) noise is most effective when it exists on the same axis as the motion to be detected, and c) noise is less effective in reducing sensitivity to motion in the "pitch" and "roll" axes, than in the longitudinal and lateral axes.

In a final part of the project we combined the work on visual displays, vection, and real motion to determine interactions between them. The main finding was that sensitivity to real motion is decreased in the presence of illusory self-motion (i.e., vection). This is an extremely important result in that it suggests that more emphasis should be placed upon enhancing vection as a means of rendering unnoticeable any unwanted real motion.

A description of a portion of the project will appear in the Proceedings of the 1986 meeting of the Royal Aeronautical Society entitled: "Advances in Flight Simulation, Visual and Motion Systems" (London).

Name/Nom: J. DAVID N. CHEEKE
Department/Département: Département de physique
University/Université: Université de Sherbrooke
Phone number(Optional)/N° de téléphone (facultatif): (819) 821-7054 ou 55
Title of Project/Titre du projet: Microscopie Acoustique

Microscopie Acoustique

J.D.N. Cheeke
Université de Sherbrooke

La microscopie acoustique est une méthode d'imagerie ultrasonore développée à l'Université Stanford en 1973. Le principe est de focaliser les ultrasons à l'aide d'une cavité sphérique en un point focal limité par la diffraction. En faisant un balayage mécanique sur la surface de l'échantillon, on peut faire une image acoustique. Le champ de vue est typiquement 1mm. par 1mm. ou moins, et le temps pour faire une image est de l'ordre de 20 secondes. La technique comporte plusieurs avantages par rapport à la microscopie optique, notamment un contraste intrinsèque très élèvé et une sensibilité aux propriétés acoustiques des matériaux, comme la densité et la vitesse du son. Un gros avantage est qu'il est possible d'imager les microstructures en profondeur, qui sont inaccessibles optiquement. Finalement, on peut aussi obtenir des renseignements quantitatifs sur la vitesse du son et l'atténuation des ultrasons à l'échelle locale, et ceci en fonction de la direction.

Dans le présent projet, nous avons construit plusieurs microscopes acoustiques avec des résolutions spatiales de l'ordre de 1 à 10 microns. Certaines études ont porté sur la microscopie à très basse température pour étudier des problèmes cryogéniques. Nous avons aussi appliqué le microscope à l'étude de la physique fondamentale, principalement pour étudier les phénomènes non linéaires près du foyer. La plupart des travaux actuels sont axés vers les applications industriels et l'identification des problèmes qu'on pourrait résoudre avec le microscope. D'autre part, nous avons entrepris un travail de développement dans le but de sortir un prototype commercialisable.

Bibliographie

(1) "Transmission Acoustic Microscopy with Focal Plane Detection"
L. Germain, A.Beauséjour et J.D.N. Cheeke
IEEE 1985 Ultrasonics Symposium, pp 768 - 771

(2) "Imaging of Piezoelectric Transducer Vibrations by Scanning Acoustic Microscopy"
L. Germain et J. D.N. Cheeke, Acoustics Letters 9, 75, 1985

(3) "Low Temperature Acoustic Microscopy at Ultrasonic Frequencies"
J.D.N. Cheeke et L. Germain
Papier invité au 6ième Symposium sur l'électronique ultrasonore
Jpn. Jour. Appl. Phys. 25, 18, 1986

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FIELD OF RESEARCH / DOMAINE DE RECHERCHE
(Check one cocher la case appropriee)

- ☐ Biotechnology / Biotechnologie
- ☐ Food-Agriculture / Alimentation-Agriculture
- ☐ Communications and Computers / Telecommunications et informatique
- ☐ Industrial Materials and Processes / Materiaux et procedes industriels
- ☐ Energy / Energie
- ☐ Oceans / Oceans
- ☐ Environmental Toxicology / Toxicologie de l'environnement
- ☒ Open / Ouvert

Name/Nom: Erich Dimroth (Jacques Carignan)
Department/Département: Sciences appliquées
University/Université: Du Québec à Chicoutimi
Phone number (optional)/N° de téléphone (facultatif): (418)545-5227

Title of Project/Titre du projet: Modélisation des évolutions géologique et métallogénique de la ceinture Abitibi.

Le présent projet avait pour but de réaliser la modélisation des évolutions géologique et métallogénique de la ceinture Abitibi.

Dans un premier temps, nous avons tenté de reconstruire l'évolution paléogéographique de la région de Chibougamau, en particulier du sommet du Groupe de Roy et du Groupe d'Opémisca. Cette reconstruction a été publiée et une première comparaison de l'évolution paléogéographique des régions de Chibougamau et de Rouyn-Noranda a également parue.

D'autre part, l'étude de la chronologie des masses plutoniques a permis une classification chronologique de ces masses en quatre catégories d'âge (gneiss, pré-Kénoréen, plutons et complexes anorthositiques syn-volcaniques, plutons syn et post-cinématiques) et une étude détaillée d'un pluton de gneiss pré-Kénoréen et d'un pluton syn et postcinématique.

Nous avons établi un modèle global de l'évolution tectonique de la région de Chibougamau et clarifié l'évolution géomécanique et l'âge des différentes failles de cette région.

Enfin, le modèle métallogénique de la région de Chibougamau présente une nouvelle classification des systèmes hydrothermaux qui ont donné naissance aux dépôts minéralisés et clarifié l'âge des différentes minéralisations. Le modèle de formation des gisements filoniens est basé sur la géomécanique de la formation des dépôts en veines et sur la corrélation entre l'évolution des fluides minéralisateurs et l'évolution géomécanique des veines. Certains porphyres cuprifères de la région de Chibougamau ont été comparés avec des porphyres cuprifères Phanérozoiques.

Tous ces résultats ont des implications importantes pour la stratégie d'exploration et constituent des applications pratiques pour l'industrie minière. Mentionnons en particulier le modèle géomécanique et d'évolution des fluides, l'identification du type de fluide et de la structure responsable de l'enrichissement aurifère, l'identification de plusieurs épisodes de minéralisation aurifère corrélables avec l'évolution tectonique et lithologique, l'identification pour la première fois de filons précieux de type épithermal et la possibilité de trouver des minéraux du Groupe Platinoides.

Name/Nom: E.B. Dumbroff and J.E. Thompson
Department/Département: Biology
University/Université: Waterloo
Phone number(Optional)/N° de téléphone (facultatif): 519-885-1211, Ext. 2563
Title of Project/Titre du projet: Drought Tolerance and Physiological Mechanisms of Resistance in Coniferous Planting Stock

A series of studies were conducted to address the problems associated with drought stress in newly outplanted seedlings of black and white spruce and jack pine. The work was wholly mission-oriented with the specific objectives of providing the basic physiological information and developing the practical treatments necessary to increase the drought resistance of containerized planting stock. The practical phase of the program included tests of a range of commercial plant growth regulators, solute-loading techniques, mulches, antitranspirants, and temperature and light regimes that altered root to shoot ratios.

All three conifers showed some adjustment to drought, but the level of stress resistance was highest in white spruce and jack pine, with white spruce most resistant to actual desiccation of its tissues. The principal physiological changes that contributed to drought resistance included the synthesis of stress hormones and increases in the concentration of cell sap resulting from loss of water and from the accumulation of free amino acids and soluble carbohydrates.

Ion loading of the roots using a soil drench of KCl combined with the use of a commercial antitranspirant spray (Folicote) and a commercial spray mulch (Agricote) increased survival of all three species by up to 12 days when they were droughted at day/night temperatures of 25° and 20°C. Although Dow Corning silicone antitranspirant (X-1337) proved more effective at reducing water loss than Folicote, the silicone spray caused significant damage to the foliage at all concentrations in excess of approximately 60% v/v with water. However, a 40% formulation was not toxic, and it increased 50% survival in all three conifers by 6 days, a full 3 days more than Folicote alone!

Under conditions of severe drought, induced by day/night temperatures of 30° and 24°C, the 40% formulation of the silicone spray increased seedling survival by an average of only 3 days, but survival times at the higher temperatures were extended by a full 6 days when the silicone antitranspirant was used in conjunction with the Agricote spray mulch.

The efficacy of ion loading with KCl was depressed under conditions of high stress (30°/24°C), and while survival times were extended by up to 3 days over those of untreated seedlings, the spruces exhibited severe salt damage, a condition not recorded during moisture stress at the lower temperatures.

Exposure of plantable seedlings to low temperatures (6°C) and short photoperiods (4h) for 3 weeks prior to drought stress sharply reduced shoot growth, altered root to shoot ratios and, in the case of jack pine, produced a more compact seedling. Nevertheless, bud-set did not occur, root growth remained active, and new shoot growth commenced soon after returning the seedlings to warm temperatures and normal photoperiods. Growth rate of the shoots remained suppressed for at least 2 weeks after treatment, with a consequent reduction in seedling water consumption and an increase in survival of 3 days in white spruce and jack pine and 6 days in black spruce.

Survival of the three conifers was extended by 3 to 6 days when seedlings were treated with a soil drench of Triadimefon, a commercial fungicide and growth retardant that has been shown to effectively reduce transpiration and shoot growth of agronomic plants.

Publications To Date. (a) F.G. Buxton, D.R. Cyr, D.P. Webb and E.B. Dumbroff. 1985. Physiological responses of three northern conifers to rapid and slow induction of moisture stress. Can. J. Bot. 63:1171-1176. (b) D.R. Roberts and E.B. Dumbroff. 1986. Relationships among drought resistance, transpiration rates, and abscisic acid levels in three northern conifers. Tree Physiol. 1:161-167. (c) C.J. Goh, K. Craven, J. Lepock and E.B. Dumbroff. 1987. Analysis of all protein amino acids as their tert-butyldimethylsilyl derivatives by gas-liquid chromatography (submitted). Two additional papers are in preparation.

Name/Nom: GHISTA, D.N.
Department/Département: Engineering-Physics and Medicine
University/Université: McMaster
Phone number(Optional)/N° de téléphone (facultatif): (416) 525-9140 (x2784)
Title of Project/Titre du projet: Comprehensive assessment of cardiac pumping function in terms of intraleft ventricular blood flow velocity and differential pressure distributions derived from linearіograms.

An area which noninvasive cardiology has failed to address is quantitative functional assessment **of the LV as a Blood Pump**. Traditionally, the major determinants of LV function have been end-diastolic pressure and volume, stroke volume and stroke power. However, these determinants do not intrinsically assess LV pump function or dysfunction in the form of LV resistance-to-filling and contractilit.

Further, for deciding candidacy for coronary bypass surgery, improved wall motion and ejection-fraction following administration of nitroglycerin are employed as guidelines. However, these indices do not indicate if, following coronary bypass surgery, the myocardium will contribute to improved ventricular functional efficiency by decreasing resistance-to-filling and setting up a more favourable intra-ventricular pressure gradient during ejection.

We have developed a **solution to these problems**, through our method of determining the instantaneous distributions of intra-LV flow velocity and differential-pressure during diastolic and ejection phases, to characterize diastolic resistance-to-LV filling and a new intrinsic index of contractility. Further, by comparing intra-LV flow velocity and defferential-pressure distributions before and after administration of nitroglycerin, we can assess how the myocardium is going to respond, and improve these LV functional indices after coronary bypass surgery.

We are thus developing and implementing this basis for prescribing **candidacy for coronary bypass surgery**. Resistance-to-filling is now depicted very clearly and graphically in terms of a pressure-gradient that the incoming blood has to overcome to order to fill the left ventricle. Likewise, contractility is now graphically and quantitatively displayed by means of the "apex-to-aortic valve" pressure-gradient, conductive to facilitating ejection.

Name/Nom: E.A. McBean and G.J. Farquhar
Department/Département: Civil Engineering
University/Université: University of Waterloo
Phone number(Optional)/N° de téléphone (facultatif): 519) 885-1211, Ext. 3349
Title of Project/Titre du projet:
"Design of Acid Rain Abatement Strategies Incorporating Uncertainties

2. Summary of Completed Strategic Research Projects

The detrimental effects of large scale releases of oxides of sulfur and nitrogen are well documented. However, the principal emitters have thus far resisted implementing "blanket" reduction programs because economic analyses of these programs have indicated the costs will be very large. This research has shown that an estimated cost of an across-the-board emission reduction of 50 percent for all North American sources would be in excess of 66 billion dollars. It is not unexpected, therefore, that emitters oppose such programs on any, and all, grounds. However, environmental concerns dictate that a large scale emission reduction program must be instituted. Of considerable interest is a detailed emission reduction strategy that achieves required acidic deposition abatement levels for lower costs.

A major focus of the research was the development of a mechanism through which acid rain abatement can be achieved at minimum cost. Mathematical models of a linear programming type were developed. The models are designed to find least-cost methods to reduce pollutant emissions to achieve stipulated receptor deposition rates, subject to technological and political constraints. Elements of the model include: an emission vector, cost-removal relationships for pollution sources, maximum receptor deposition rates, and transfer mechanisms to relate pollutant emissions to depositions.

Although very useful, the utilization of expected value models for this type of problem is subject to considerable criticism. Elements of the acid rain problem are random variables; thus, a major effort of the research was the examination of measures of uncertainty. More specifically, the examinations included:

i) a statistical characterization of transport phenomena - the physical, climatological and meteorological varaibility; seasonal and annual variation in these parameters;

ii) transfer mechanics of sulfuric pollutants;

iii) the formulation and use of a stochastic linear programming model;

iv) the examination of nitrogen oxide emission control strategies;

v) the development of a computer model to examine environmental response to acidic loadings - the model simulates the soil chemistry with time under varied acid rain loadings.

Name/Nom: Pharis, Richard P., and Owens, John N.
Department/Département: Biology Departments, Univ. of Calgary and Univ. of Victoria, resp.
University/Université:
Phone number(Optional)/N° de téléphone (facultatif): 403-220-5259 (RPP) and 604-721-7113 (JNO)
Title of Project/Titre du projet: FOREST TREE IMPROVEMENT: ANATOMICAL, PHYSIOLOGICAL AND BIOCHEMICAL APPROACHES TO OBTAINING EARLY AND ENHANCED SEED PRODUCTION IN CONIFER

A better understanding of how conifers flower is essential for future success in both breeding programmes and seed production of genetically superior trees of commercial import. We used a cultural manipulative treatment, the pruning of the root system, to promote flowering in seedlings and clonal propagules of Douglas fir. This cultural treatment thus became a working tool by which we could study the anatomy, physiology, and biochemistry (especially hormone physiology and biochemistry) of the flowering process. Information gained using this technique has allowed us to better define just when the flower-promotive hormones (gibberellin $A_{4/7}$ mixture [$GA_{4/7}$]) should be applied for optimal effect, and at what dose. As a result we can now better predict the optimal timing of adjunct cultural treatments, and dosage and timing of the $GA_{4/7}$ treatment, to obtain either precocious flowering (for breeding purposes), or enhanced flowering (for seed production purposes). Our findings have also shed insight into the basic process of flowering in Pinaceae family conifers. Firstly, a treatment, such as rootpruning, is most effective in promoting flowering when apical bud development is retarded during the phase of rapid elongation. Additional work with spruce using other cultural treatments (drought and heat in various combinations) furthers the concept that treatments which retard development and delay the time of cone-bud differentiation (until after shoot elongation is complete) enhance cone-bud production. The other promotive treatment, use of the $GA_{4/7}$ hormone, had no such effect on retarding development, yet interacted synergistically with the several cultural treatments. We thus conclude that $GA_{4/7}$ has a direct morphogenic effect on initiation and/or differentiation of the cone-bud, an effect separate from, or in addition to any diversion of nutrients to the differentiating lateral primordia.

One other effect the cultural treatment appears to be having is to block the metabolism of endogenous less polar GAs into more polar GAs, the latter presumably being GAs which are effectors of vegetative growth. Such a block probably also functions for exogenously applied $GA_{4/7}$. The end result of the cultural treatment is thus not only a build-up of endogenous less polar (florigenic?) GAs, but also a longer biological life (in terms of flowering efficacy) of the applied $GA_{4/7}$.

Practical control of female flowering (cone and seed production) in Canada's commercially important conifers is now a reality. Whether the potential of this technique becomes realized, however, depends upon continued and additional funding for both research and development in forest tree biology, and in the tree improvement and seed production programmes of the provinces, and of private industry. The means are there, but whether the will exists remains to be seen.

Name/Nom: DR. H.J.J. SEGUIN & DR. C.E. CAPJACK
Department/Département: ELECTRICAL ENGINEERING
University/Université: UNIVERSITY OF ALBERTA
Phone number(Optional)/N° de téléphone (facultatif): (403) 432 3335
Title of Project/Titre du projet: GLOW DISCHARGE STABILIZATION WITH MAGNETIC FIELDS

Extensive theoretical and experimental data has been amassed on the application of our patented Magnetic Discharge Stabilization process to CW CO2 laser devices. The first realization of the technique in an actual device has been in the form of a co-axial geometry "MAGPIE" laser. This unique proof-of-principle machine also incorporates features of our previously developed PIE excitation process; along with a multi-element fluid-ballasted cathode.

Preliminary operational data is most encouraging, and suggests that such a MAGPIE geometry could provide a effective method of constructing relatively compact, light weight, medium powered, (~ 1 kW) CW machines; suitable for a wide variety of industrial applications.

Further results also indicate that this magnetic discharge stabilization approach may be equally applicable to other gas discharge devices; including Excimer systems.

Two patents and 20 scientific publications have thus far been generated out of this work. These are as follows:

1. V.A. Seguin, C.E. Capjack, and H.J.J. Seguin, 1986, J. Of.Phys.D,(in press).
2. V.A. Seguin, H.J.J. Seguin, C.E. Capjack, 1986, Rev.Sci.Instr,(in press).
3. V.A. Seguin, H.J.J. Seguin, C.E. Capjack, 1986,I.E.E.J.Quant.Elect,(inpress).
4. V.A. Seguin, H.J.J. Seguin, C.E. Capjack, 1986,J. Appl.Opt.,Vol.25, p.3825
5. V.A. Seguin, H.J.J. Seguin, and C.E. Capjack, 1986,J.Appl.Opt.(accepted).
6. V.A. Seguin, H.J.J. Seguin, C.E. Capjack, 1986,J.Appl.Phys.,Vol.60, p.3088
7. R. Razdan, C.E. Capjack, H.J.J. Seguin, 1986, J. Appl. Phys., (in press).
8. R. Razdan, C.E. Capjack, H.J.J. Seguin,1986, Appl.Phys.Lets.,Vol.48, p.1513
9. R. Razdan, C.E. Capjack, H.J.J. Seguin, 1984,J. Appl. Phys.Vol.57, p.4954
10. V.A. Seguin, H.J.J. Seguin, C.E. Capjack, 1984, Appl. Opt.,Vol.24, p.1265
11. D. M. Antoniuk, H.J.J. Seguin, C.E. Capjack,1984,Appl.Phys.B,Vol.35,p.155
12. V.A. Seguin, H.J.J. Seguin, C.E. Capjack, 1984,Rev.Sci.Instr.,Vol.55,p.1445
13. D.M. Antoniuk, C.E. Capjack, H.J.J. Seguin,1984,Appl.Phys.,Vol.55,p.708
14. H.J.J.Seguin,C.E.Capjack,D.M.Antoniuk,V.A.Seguin,1982,Apl.Phys.Let.Vol.39,p.203
15. C.E.Capjack,H.J.J.Seguin,D.M.Antoniuk,V.A.Seguin,1981,Apl.Phys.B.,Vol.26,p.204
16. C.E. Capjack, D. M. Antoniuk, H.J.J. Seguin,1981,J. Appl.Opt.Vol.52, p.4517
17. H.J.J. Seguin,C. E. Capjack,D. Antoniuk,K.A. Nam,1980,Apl.Phy.Let.Vol.37,p.130
18. V.A. Seguin, H.J.J. Seguin, C.E. Capjack,1986,CLEO "86",San Fran,CA1,June/86.
19. R. Razdan,C.E. Capjack,H.J.J. Seguin,V.A. Seguin,1986,J.Appl.Phys.(submitted)
20. R. Willis, H.J.J Seguin, and C.E. Capjack, 1986, Appl.Phys. Lett.(submitted)

Patents: US # 4,604,752 [Aug.5, 1986]: Canadian # 121,0844 [Sept. 2, 1986].

Name/Nom: Léon E. St-Pierre
Department/Département: Chemistry
University/Université: McGill University, 801 Sherbrooke St. W., Montréal H3A 2K6
Phone number(Optional)/N° de téléphone (facultatif): 514-398-6914
Title of Project/Titre du projet: THE DEVELOPMENT OF SPECIFIC POLYMER ADSORBENTS FOR REMOVAL OF BILIRUBIN FROM PLASMA

In the original proposal for the Strategic Grant the objectives were stated to be "The design and synthesis of biocompatible sorbents for rapid, specific adsorption of bilirubin from blood plasma".

The adsorbents that have been prepared are composed of functionalized, hydrophilic polymer (cross-linked polyamide-type beads) backbones to which are attached pendants consisting of various sequences of amino acids by Merrifield solid phase peptide synthesis techniques. The pendants, designed to be the active sites in adsorption, are chosen to mimic sites that have been proposed as possible binding sites for bilirubin by human serum albumin (HSA). Approximately sixty different adsorbents have been prepared, with the general structure (amino acid)$_x$(alanine)$_3$polymer, where (amino acid) represents a sequence of either identical or different amino acids with $x \leq 15$. Isotherms and binding constants have been determined for the adsorption of bilirubin from aqueous phosphate buffer solutions (pH = 7.8). These indicate that the predominant feature required for strong binding is amino acids with basic R groups, as in the case of arginine and lysine. A strong interaction between the COOH groups of bilirubin and the amino functions of the pendants has been demonstrated by determining relaxation times using NMR spectroscopy. However, other features such as conformation of the peptide pendants and hydrophobic binding are also important. Sorbents have been prepared with a capacity, measured on the basis of moles of bilirubin adsorbed/equivalent of functional group on the resin, that exceeds by a factor of about 100 that of cholestyramine, used commercially for adsorbing bilirubin. Furthermore, the binding constants for these sorbents are comparable to those for binding of bilirubin by HSA.

Certain new objectives have arisen as a result of the work completed. Originally the application of these materials was expected to be in hemoperfusion devices. However, because it is technically quite complex, this process is limited in application and the goals of the present work have been expanded to include the production of sorbents that can be used by ingestion so that they adsorb bilirubin in the gastrointestinal tract. This offers certain complications in that the hydrolysis of the peptide pendants, either chemically or enzymatically, may need to be controlled. To counter this effect resins based on dextro amino acids have been synthesized and shown to have adsorption characteristics similar to that of their levo analogues.

"Optimal" resins are presently being synthesized for animal testing in the laboratories of Professor T.M.S. Chang, Director of the Artificial Cells and Organs Research Centre at McGill. They will be applied both in hemoperfusion and in oral ingestion. A second application is currently underway in cooperation with Dr. Carl Goresky, Montreal General Hospital. Here the resins are being used as adsorbents for bilirubin and two of its conjugates. The determination of the relative abundances of these species in blood plasma is the basis for the diagnosis of certain hepato-biliary diseases.

Success in these and other applications will be followed by commercialization. A United States patent (No. 4,593,073, June 3, 1986), assigned to McGill University, has been issued covering this work. A patent application has been filed in Canada. (The complete bilibliography for other reports in scientific journals are listed in the Final Report.)

Name/Nom: Dr. Stephen G. Withers
Department/Département: Chemistry
University/Université: University of British Columbia
Phone number(Optional)/N° de téléphone (facultatif):
Title of Project/Titre du projet: Glycosidase Inhibitors As Antifungal Agents and Wood Preservatives

SUMMARY

Wood rot is a major problem, and the financial cost of damage caused by wood rot in North America has been estimated at $1 billion annually. Since this rot is commonly caused by fungi that attack the wood and destroy it by degrading its chemical components (primarily a polysaccharide, cellulose), a good way to preserve wood is to kill any invading fungi. This has formed the basis for the wood-preservatives industry, but the preservatives used (e.g., creosote, pentachlorophenol) are now thought to be environmentally hazardous. This project is aimed at synthesis and testing of very selective fungicides that will act as wood preservatives by inactivating the actual enzymes released by the fungi that are directly responsible for degradation of the cellulose. In this way, the degradation process will be halted, and the fungi starved of their food source and thus killed. The design of these inhibitors is based upon what is known of the chemical mechanism of these enzymes (glycosidases) and upon the structure of naturally occurring inhibitors of a related series of enzymes, the amylases.

A second approach followed was to synthesize compounds (profungicides) that themselves are relatively biologically inert, but when degraded by the fungal enzymes produce a potent fungicide. Since they should only be degraded upon fungal attack they should be fairly specific. Three different profungicides were synthesized and preliminary testing in collaboration with Forintek Canada Inc. has shown them to have pronounced antifungal activity, but to be inert to bacteria.

Several enzyme inhibitors were synthesized that were shown to be extremely effective at inactivating the enzymes in question. A full analysis of their mode of inhibition has been performed and they behave precisely as predicted. Since a third year of funding was not granted it has not been possible to carry these compounds through to testing against fungi.

Several publications are currently being prepared that arise from this work. These will focus on the chemical syntheses and on the enzymology relating to these inhibitors.

SUMMARIES OF COMPLETED RESEARCH PROJECTS /

TRAVAUX DE RECHERCHE TERMINÉS

Description

86. Strategic grants are offered to individuals and groups to assist with the direct operating costs of research projects (including the organization of workshops and seminars) or with the purchase of equipment essential to the pursuit of research projects in the following areas:

- biotechnology
- communications and computers
- energy
- environmental toxicology
- food and agriculture
- industrial materials and processes
- oceans

In addition, through an "open" area, researchers may submit proposals in fields of national concern other than the seven designated areas.

Although individual applications are considered, group applications with a multifaceted approach are encouraged.

Strategic conference grants assist with the organization of conferences in areas of national concern.

Strategic Equipment Grants

104. Strategic equipment grants must only be used to purchase the equipment for which the grant was awarded. If recipients of strategic equipment grants do not require the full amount awarded for this purpose, they must refund the balance to NSERC. A researcher who is not able to purchase the equipment specified, or who wishes to select alternative equipment, must submit a written request to NSERC outlining the reasons for the change. The modified request will be assessed and the grantee will be informed of Council's decision.

NSERC expects beneficiaries of strategic equipment grants to make operating time available to other interested researchers whenever possible.

General Principles

205. Grant funds must be used effectively, economically, and in the best interest of the research supported by the grant. The financial administration of grants and the conditions governing their use are not intended to restrict grantees, but to ensure good accounting and administrative practices.

The administration of NSERC grants is carried out by three parties: the grantee, the university and NSERC.

- The grantee approves expenditures in accordance with NSERC regulations (outlined in the Awards Guide or imposed as a condition of a grant) and with university policies.
- The university administers the grant funds and establishes appropriate policies, controls and systems to ensure that NSERC policies and regulations are followed.
- NSERC defines the conditions under which grant funds may be used, monitors the use of grant funds, and interprets its rules and regulations for the university and grantees.

Description

86. Les subventions thématiques sont accordées à des chercheurs individuels ou à des groupes pour aider à couvrir les frais directs de leurs projets de recherche (y compris l'organisation de colloques et séminaires) ou à acheter des appareils de recherche nécessaires dans les domaines suivants:

- alimentation et agriculture
- biotechnologie
- énergie
- matériaux et procédés industriels
- océans
- télécommunications et informatique
- toxicologie de l'environnement.

Il existe également un thème «ouvert», dans le cadre duquel les chercheurs peuvent soumettre des propositions dans des domaines d'intérêt national autres que les sept thèmes choisis.

Même si les demandes individuelles sont acceptées, le CRSNG encourage les chercheurs à présenter des demandes de groupe à caractère pluridisciplinaire.

Les subventions thématiques pour conférences soutiennent l'organisation de conférences dans des domaines d'intérêt national.

Subventions thématiques d'appareillage

104. Les subventions thématiques d'appareillage ne doivent être utilisées que pour l'achat de l'appareillage pour lequel la subvention a été accordée. On doit retourner au CRSNG tout montant non utilisé à cette fin. Un chercheur qui ne peut acheter l'appareillage décrit dans la demande ou encore qui désire choisir un autre appareil doit faire une demande écrite au CRSNG, en donnant les raisons du changement. Le CRSNG étudiera la demande et informera le bénéficiaire de sa décision

Le CRSNG s'attend à ce que les bénéficiaires de subvention thématique d'appareillage mettent du temps de fonctionnement de l'appareil à la disposition d'autres chercheurs intéressés, lorsque cela est possible.

Principes généraux

205. Les subventions doivent être utilisées de façon efficace et économique, de manière à favoriser le plus possible la recherche subventionnée. L'administration financière des subventions et les conditions régissant leur utilisation n'imposent au bénéficiaire qu'un minimum de restrictions, mais exigent de bonnes pratiques comptables et administratives.

Les subventions du CRSNG sont administrées par trois parties: le bénéficiaire, l'université et le CRSNG:

- le bénéficiaire approuve les dépenses en se conformant aux règlements du CRSNG (décrits dans le Guide des subventions ou imposés lors de l'octroi de la subvention) et aux politiques de l'université;
- l'université administre les fonds et établit les politiques, les contrôles et les systèmes nécessaires pour assurer le respect des politiques et règlements du CRSNG;
- le CRSNG définit les conditions régissant l'utilisation des fonds, contrôle l'utilisation des fonds et interprète ses règlements pour l'université et les bénéficiaires.

This chapter describes the financial administration of grant funds and outlines the regulations governing their use. Grantees who wish to use their grant funds to purchase resources or services not covered by explicit NSERC guidelines must consult their research grants officer or business officer, prior to committing any NSERC grant funds to such a purchase. If there is no explicit NSERC guideline to answer a question or no university policy covering the subject, the research grants officer or the business officer will seek an appropriate ruling from NSERC.

Fiscal Period

212. NSERC grants are awarded to cover expenditures incurred during a specific period of time termed the fiscal period. The fiscal period for operating grants commences on April 1 of the year of the initial award and may be for one, two or three years. The fiscal period for strategic grants commences on November 1 of the year of the initial award and may be for one, two or three years. If not otherwise specified in published program descriptions or in direct correspondence with grantees, the fiscal period for other awards is one year from the date of the award (see paragraph 213). Upon receipt of a written request, NSERC may extend the fiscal time period of the grant if it is considered to be in the best interest of the research.

Commitments

215. NSERC receives funds for its programs through annual parliamentary appropriations. Thus, all commitments for support beyond the current fiscal year (e.g., second and third instalments of two- and three-year grants) are made subject to the availability of funds. Under no circumstances is NSERC able to accept responsibility for commitments incurred by grantees that exceed the actual funds to their credit in the NSERC Common Grant Account at the university.

Indirect or Overhead Costs

219. The funds provided through NSERC grants in aid of university research must not be used to contribute to the payment of indirect or overhead costs of research.

Payment of Salaries and Stipends

222. NSERC grantees may use their research grant funds to contribute towards the payment of salaries or stipends of qualified people working in their laboratories on a part-time or full-time basis. However, grant funds must not be used to pay any part of the salary or employee benefit plans of the grantee, members of the grantee's immediate family, other staff members of a Canadian university whose status would make them eligible to apply on their own behalf for NSERC grants, or recipients of other direct NSERC support. Grant funds must not be used to employ secretaries, but may be used to pay for typing services for manuscripts and reports.

Ce chapitre décrit l'administration financière des subventions et les règlements en régissant l'utilisation. Le bénéficiaire qui désire utiliser ses fonds pour acheter des ressources ou des services non prévus dans les directives explicites du CRSNG doit consulter le responsable de la recherche ou du service des finances avant d'engager une part quelconque des fonds du CRSNG pour l'achat envisagé. Si les directives du CRSNG ne peuvent répondre à une question, ou s'il n'existe pas de politique universitaire à ce sujet, le responsable de la recherche ou du service des finances s'en remettra au CRSNG pour obtenir une décision appropriée.

Période financière

212. Les subventions du CRSNG couvrent les dépenses engagées pendant une période désignée période comptable. La période comptable des subventions pour dépenses courantes débute le 1er avril et peut durer un, deux ou trois ans. La période comptable des subventions thématiques débute le 1er novembre de l'année où la subvention est accordée et peut durer un, deux ou trois ans. À moins d'indication contraire dans la description du programme ou dans les conditions d'octroi, la période comptable des autres subventions dure un an à compter de la date d'octroi (voir l'article 213). Sur réception d'une demande écrite, le CRSNG peut prolonger la période comptable d'une subvention s'il juge que c'est dans le meilleur intérêt de la recherche.

Engagements

215. Le CRSNG reçoit du gouvernement des fonds pour ses programmes de subventions et bourses sous forme de crédits parlementaires annuels. Le CRSNG prend donc des engagements pour les années financières postérieures à l'année courante (p. ex. les deuxième et troisième versements de subventions de deux ou de trois ans) sous réserve de la disponibilité des fonds. Le CRSNG ne peut donc accepter aucune responsabilité à l'égard d'engagements financiers qui dépassent les fonds disponibles dans le compte commun des subventions à l'université.

Frais indirects ou généraux

219. Les bénéficiaires ne doivent pas utiliser les fonds octroyés par le CRSNG dans le cadre de ses programmes de subventions pour payer des frais indirects ou généraux de recherche.

Salaires et traitements

222. Les bénéficiaires de subvention du CRSNG peuvent utiliser leur subvention de recherche pour payer les salaires ou traitements de personnes qualifiées travaillant à temps complet ou partiel dans leurs laboratoires. Cependant, ils ne peuvent s'en servir pour payer une partie du salaire ou les avantages sociaux du bénéficiaire, des membres de sa famille immédiate, des membres du personnel d'une université admissibles aux subventions du CRSNG ou encore des bénéficiaires d'autre forme d'aide directe du CRSNG. Ils ne peuvent l'utiliser pour employer une secrétaire, mais peuvent s'en servir pour payer les services de dactylographie pour les manuscrits et les rapports.

Persons in one of the following three categories may be employed under a grant:

— assistants employed to help grantees carry out their research (research associates, research assistants, undergraduate students, programmers, technicians and other technical and non-professional assistants);
— postgraduate students and postdoctoral fellows receiving a stipend to work under the grantee's supervision or as collaborators to the grantee; such persons may not, however, be paid from infrastructure grants;
— visiting scientists receiving transportation, meal and accommodation expenses and stipends (if they are not themselves eligible to apply for NSERC grants) when invited by grantees to collaborate with them.

Summary of Salaries and Stipends from Grants

Assistants
—subject to university policies

Graduate students

—per annum:	$10,560
—per month:	$ 880

Purchase of Equipment and Other Materiel

237. When purchasing equipment and materiel, grantees must follow university procedures related to purchasing. Grantees must explore the possibility of purchasing equipment manufactured in Canada. Refer to paragraph 249 concerning the purchase of powered vehicles.

Ownership of Equipment and Other Materiel

238. All equipment and materiel (including specialized books and publications, small assets such as cameras, small calculators, binoculars, tents, skis, etc.) purchased with NSERC grant funds belong to the university and not to the individual grantee.

When a researcher is moving to another Canadian university and wishes to move equipment or other materiel purchased with NSERC grant funds, Council encourages the university to accede to such a request provided the equipment is not necessary for the research activities of other researchers at that university. Assets so moved will belong to the new university.

Computing Costs

241. Grant funds may be used towards payment of charges for machine time, programming services and other related expenses essential to the conduct of the research for which the grant was awarded.

Les personnes appartenant à l'une ou l'autre des catégories suivantes peuvent être rémunérées à même une subvention:

— adjoints engagés pour aider le bénéficiaire à réaliser son projet (attachés, adjoints de recherche, étudiants de 1er cycle, programmeurs, techniciens et autres adjoints techniques ou non professionnels);
— étudiants de 2e ou 3e cycle et stagiaires postdoctoraux recevant un traitement pour travailler sous la direction du bénéficiaire ou en collaboration avec lui; ces derniers ne peuvent toutefois pas être rémunérés à même une subvention d'infrastructure;
— scientifiques invités recevant des frais de déplacement, de repas et de logement et un traitement (s'ils ne sont pas eux-mêmes admissibles aux subventions du CRSNG) lorsqu'ils sont invités par le bénéficiaire à collaborer avec lui.

Résumé des salaires et traitements payés à même les subventions

Adjoints
—traitements assujettis aux politiques de l'université

Étudiants (2e et 3e cycles)

—par an:	10 560$
—par mois:	880$

Achat d'appareillage et de fournitures

237. L'acquisition d'appareillage et de fournitures doit respecter les politiques d'achat de l'université. Les bénéficiaires doivent étudier la possibilité d'acheter des appareils fabriqués au Canada. Consulter l'article 249 pour les règlements régissant l'achat de véhicules motorisés.

Propriété de l'appareillage et d'autres biens

238. Tout appareillage et autre matériel (y compris, les livres et publications spécialisés, appareils-photo, calculatrices, jumelles, tentes, skis, etc.), achetés grâce à une subvention du CRSNG appartiennent à l'université, et non au bénéficiaire.

Lorsqu'un chercheur déménage dans une autre université au Canada et qu'il désire apporter avec lui les appareils ou autres biens achetés avec l'aide financière du CRSNG, le Conseil encourage l'université à accéder à sa requête si les appareils ne sont pas nécessaires aux travaux d'autres chercheurs de l'université. Les biens ainsi déménagés appartiendront à la nouvelle université.

Frais d'ordinateur

241. Les subventions du CRSNG peuvent servir à payer le temps-machine, les frais de programmation et autres frais connexes lorsque ces dépenses sont essentielles à la poursuite de la recherche pour laquelle la subvention a été accordée.

Patents

243. NSERC grantees are encouraged to seek patent protection for their inventions or developments, particularly in such a way that will benefit Canada. One method of accomplishing this is to consult with and use the services of Canadian Patents and Development Limited (CPDL). Many universities have an agreement with CPDL to achieve this end.

Publications

244. Grant funds may be used to purchase certain specialized publications not normally obtainable through the university library and that are essential to the research supported by Council. These may include special tables, catalogues of functions, published data, specialized journals and like material. Such publications belong to the university.

245. Grant funds may be used towards costs involved in the preparation of manuscripts, whether for articles in research journals or books, and towards the payment of page charges for publication in scientific journals. Grant funds must not, however, be used to pay for printing costs involved in the publication of a book.

246. Grantees are encouraged, whenever possible, to publish the results of their NSERC supported research in Canadian journals, including not only the Canadian Journals of Research published by the National Research Council, but other Canadian scientific and technical publications as well.

Acknowledgement of NSERC Support

247. In any publication arising from research supported by Council grants, acknowledgement of NSERC assistance is expected.

Travel Expenses

248. Grant funds may be used to pay transportation, accommodation and meal expenses incurred during brief trips away from the grantee's university when these are essential to the research funded through the grant. The expenses may be incurred by grantees or by persons working with or for the grantees. Such trips include field trips (e.g., to collect specimens or samples or to use facilities located elsewhere), trips to consult with colleagues and attendance at conferences, meetings, symposia, etc. Transportation to and from the location(s) of sabbatical leave and personal living expenses while at the place(s) of sabbatical leave are not allowable expenses from operating grants. However, field trips and conference travel during the period of sabbatical leave are allowable as specified above.

Research travel associated with leave in excess of three months is not normally considered a brief trip, but under certain circumstances may be supported through NSERC grants.

Brevets

243. Les bénéficiaires de subvention du CRSNG auraient avantage à protéger leurs inventions ou leurs découvertes, particulièrement de façon à en faire bénéficier le Canada. Ils peuvent, à cette fin, consulter la Société canadienne des brevets et d'exploitation Limitée (SCBE) et recourir à ses services. Plusieurs universités ont conclu à cet effet un accord avec cette société.

Publications

244. Les subventions peuvent être utilisées pour l'achat de publications spéciales, comme des tables de données, des catalogues de fonctions mathématiques, des revues spécialisées et autres renseignements du genre qui ne peuvent être obtenus dans les bibliothèques des universités et qui sont nécessaires à la bonne marche des travaux de recherche subventionnés par le Conseil. Ces publications appartiennent à l'université.

245. On peut se servir des subventions pour payer les frais engagés lors de la préparation des manuscrits, qu'il s'agisse d'articles dans des revues scientifiques ou de livres, et pour payer les frais de publication dans des revues scientifiques. On ne peut toutefois se servir de ces fonds pour payer les frais d'impression qu'entraîne la publication d'un livre.

246. On encourage les bénéficiaires de subventions à publier les résultats de leur recherche subventionnée par le CRSNG dans des journaux canadiens, si possible. Il peut s'agir non seulement des journaux canadiens de recherche publiés par le CNRC, mais aussi d'autres publications scientifiques et techniques canadiennes.

Mention de l'aide du CRSNG

247. Le CRSNG s'attend à ce que les bénéficiaires mentionnent l'aide reçue dans toute publication réalisée grâce à une subvention du Conseil.

Frais de déplacement

248. Les subventions du CRSNG peuvent servir à couvrir les frais de transport, de logement et de repas engagés lors de brefs voyages à l'extérieur de l'université, lorsque ces déplacements sont essentiels à la conduite des travaux de recherche subventionnés. Il peut s'agir des dépenses du bénéficiaire ou de ses adjoints. Ces déplacements incluent les voyages vers les lieux d'expérience (cueillette d'échantillons ou utilisation d'installations de recherche) et pour consulter des collègues ou assister à des conférences, congrès, symposiums, etc. Les frais de déplacement (aller retour) du chercheur vers le lieu de son congé sabbatique et ses frais personnels de séjour au cours de ce congé ne sont pas admissibles. Toutefois, les voyages effectués au cours de ce même congé, vers les lieux d'expérience ou pour assister à des conférences sont admissibles, tel qu'il est précisé ci-dessus.

Tout déplacement lié à des activités de recherche et effectué au cours d'un congé de plus de trois mois n'est normalement pas considéré comme un voyage de courte durée; toutefois, il est parfois possible, dans des circonstances spéciales, d'en assurer le financement à l'aide des subventions du CRSNG.

— To spend research leave outside Canada – candidates must apply through the international programs of NSERC.
— To spend research leave within Canada for 3-6 months – operating, strategic and university-industry grant recipients must apply to NSERC for permission to use research grant funds for transportation expenses only.
— To pursue an extended field trip or to visit a foreign facility in excess of 3 months – permission must be granted by NSERC in writing.

Claims for travel expenses chargeable against NSERC grants must conform to the standard procedures and policies of each grantee's university, and a university has the right not to authorize an expenditure proposed by the grantee if such an expenditure contravenes university policies and/or any NSERC regulations. See paragraph 211 for submission of travel claims.

Grant funds must not be used to reimburse any travel expenditures for members of the grantee's immediate family.

Powered Vehicles

249. Recipients of NSERC grants may purchase a powered vehicle when essential to the research funded through the grant. However, prior university approval is required. By approving the purchase, the university accepts responsibility to provide insurance and any licence required and to register the vehicle in the name of the university. Grantees may also use their grant funds to pay for the long-term lease or short-term rental of such vehicles essential to the research funded through the grant. Grantees who wish to lease a powered vehicle on a long-term basis require the prior authority of the university. This procedure is similar to that required for an outright purchase.

Costs of short-term rentals of vehicles will be recorded on travel claims with other expenses of the field trips, etc.

If powered vehicles purchased through the grant or leased on a long-term basis through the grant are kept at a location other than the university, grantees must be prepared to certify that the vehicle will be used for research purposes only.

Organization of Conferences and Workshops

250. Grant funds must not be used to cover the cost of holding a conference or symposium. Canadian university staff members wishing to obtain funds to support the costs of transportation, meal, and accommodation expenses of guest speakers should apply for a conference grant (see paragraphs 157 to 165). Strategic grant funds may be used for the organization of workshops, provided the request was included in the application. In addition, NSERC is prepared to provide funding for the organization of university-industry workshops (paragraphs 129 to 131) or of other workshops (paragraph 166). Regulations governing these new programs will be stated in the conditions of the award. Council does not have a program of support for attendance at conferences; however, operating grant funds may be used for this purpose (paragraph 248).

— En ce qui touche les congés liés à des activités de recherche à l'extérieur du Canada – les intéressés doivent présenter une demande dans le cadre des programmes internationaux du CRSNG.
— En ce qui touche les congés liés à des activités de recherche au Canada – les bénéficiaires de subventions pour dépenses courantes, de subventions thématiques et du programme conjoint universités-industrie doivent demander au CRSNG la permission d'utiliser leur subvention pour payer leurs frais de déplacement seulement.
— En ce qui touche la prolongation de plus de trois mois d'une visite vers les lieux d'expérience et à une installation à l'étranger, les bénéficiaires doivent en recevoir la permission écrite du CRSNG.

Les frais de déplacement imputables aux subventions du CRSNG doivent être conformes aux procédures et politiques courantes de l'université de chaque bénéficiaire; cette dernière peut refuser les dépenses proposées par le bénéficiaire si elles sont contraire à ses politiques ou aux règlements du CRSNG. Voir l'article 211 pour la présentation des demandes de frais de déplacement.

Les subventions du CRSNG ne doivent pas servir à payer les dépenses de voyage des membres de la famille immédiate du bénéficiaire.

Véhicules motorisés

249. Les bénéficiaires de subventions du CRSNG peuvent acheter un véhicule motorisé lorsque ce dernier est essentiel à la conduite des travaux de recherche subventionnés. Les bénéficiaires doivent cependant obtenir l'approbation de l'université avant d'acheter tout véhicule motorisé. En approuvant l'achat, l'université accepte de fournir les assurances et les permis nécessaires et d'enregistrer le véhicule à son nom. Les bénéficiaires peuvent également utiliser leurs subventions pour payer les frais de location à long terme ou à court terme de tels véhicules lorsqu'ils sont essentiels à la conduite des travaux de recherche subventionnés. Les bénéficiaires qui désirent louer un véhicule motorisé à long terme doivent obtenir l'autorisation préalable de l'université tout comme s'ils désiraient en faire l'achat pur et simple.

Les frais de location à court terme de véhicules seront indiqués sur les demandes de frais de déplacement avec les autres dépenses de voyage vers les lieux d'expérience, etc.

Si les véhicules motorisés achetés ou loués à long terme avec les subventions du CRSNG sont gardés ailleurs qu'à l'université, les bénéficiaires doivent être prêts à certifier que le véhicule servira exclusivement aux fins de la recherche.

Organisation de conférences et colloques

250. Il est interdit de se servir des subventions pour payer les frais d'organisation de conférences. Si un membre du corps enseignant d'une université canadienne désire obtenir des fonds pour payer les frais de déplacement, de repas et de logement de conférenciers invités, il doit demander une subvention pour conférences (voir les articles 157 à 165). On peut se servir des subventions de recherche thématique pour organiser un colloque, à condition d'en avoir fait la demande. De plus, le CRSNG est prêt à subventionner des colloques dans le cadre de son programme conjoint universités-industrie (articles 129 à 131) ou dans d'autres circonstances (article 166). Les règlements s'appliquant à ces nouveaux programmes seront énoncés dans les conditions d'octroi. Le CRSNG n'a pas de programme de subvention pour venir en aide aux chercheurs qui participent à des conférences; les subventions de recherche peuvent cependant être utilisées à cette fin (voir l'article 248).